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CONTENTS OF VOLUME IX, NUMBER 1, APRIL 1953

PAGE

Town and Region: A Comparison of Palmerston North, Wanganui and New Plymouth . . . . . . *By L. L. Pownall* 1

Otago in 1871: Life and Landscape . . . *By Mary Kibblewhite* 17

Tropical Cyclones in the Southwest Pacific . . *By J. W. Hutchings* 37

A New Classification and Map of New Zealand Vegetation . *By R. S. Dick* 58

Geography in Schools: 3. Geography and Social Studies in the Post-Primary School . . . . . . *By Averilda Gorrie* 66

New Zealand in American Eyes: A Review . *By Howard J Critchfield* 72

Photogeography: Rarotonga: Pacific Outpost 79

Geographic Notebook 84

In Our Contemporaries 95

Reviews 100

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GEOGRAPHIC NOTEBOOK

PAGE
Contributors to this Issue 84
Geography and Planning 85
Commercial Air Transport 86
Population Changes 1945-1951 88
The South Pacific Commission 90
Geographers in Australia 92
Geography at A.N.Z.A.A.S. 93

IN OUR CONTEMPORARIES

1. In New Zealand Journals . . .

Town and Country . . . . . *By L. L. Pownall* 95
South Canterbury Landscapes . . . . . *By R. Coxhead* 95

2. In Overseas Journals . . .

An Urban Problem . . . . . . *By L. L. Pownall* 96
Phosphate Island . . . . . *By Joyce K. Bewley* 97
France in the Antipodes 98
Land from the Sea . . . . . *By J. A. Martin* 99

REVIEWS

A. L. Poole. Preliminary Reports of the New Zealand-American Fiordland Expedition . . . . . . *By W. R. McGregor* 100
Francis Selwyn Simcox. Otaki: The Town and District . *By L. J. Wild* 101
N. S. Seaward. The Milford Country
N. S. Seaward. Stewart Island .
John Pascoe. The Southern Alps: Part I
J. D. S. Roberts. Central Otago
R. J. Francis Smith. Rifle Sport in the South Island . *By B. H. Farrell* 102
John Kirtland Wright. Geography in the Making . *By R. A. Falla* 104
E. W. H. Briault and D. H. Shave. Geography in the Secondary School *By H. G. Dorrington* 105
E. Ford and B. Rowe. Graphic Geography: Volume I, Regions and Men *By A. H. Payne* 106

New Zealand Geographer

VOLUME IX April, 1953 NUMBER 1

TOWN AND REGION: A COMPARISON OF PALMERSTON NORTH, WANGANUI AND NEW PLYMOUTH*

L. L. POWNALL

THE assumption that the growth of a town reflects the development of its tributary region and that all towns are similarly dependent upon their rural areas for support has been accepted without adequate investigation by almost all students of urban geography in New Zealand. The truth of this theory has been tested by examining the historical development of Palmerston North, Wanganui and New Plymouth and by studying the relationship between these towns and their tributary regions.

These three cities are lowland towns of approximately the same size and of broadly similar location on the west coast of the North Island (*Fig.* 1). The tributary regions on which they partially depend have been carved from the same subtropical forest which less than a hundred years ago formed an almost continuous mantle of sombre green stretching from the northern slopes of Mt. Egmont to Cook Strait on the south and eastwards from the coast towards the interior. All are youthful centres serving the pastoral districts of Manawatu, Wanganui-Rangitikei and Taranaki respectively.

SITE AND LOCATION

Palmerston North is the most favoured by its location. The only water-gap in the main mountain axis of the southern half of the North Island lies nine miles to the northeast; the flat, triangular-shaped river plain of the Manawatu opens like a broad fan to the west and south, and access to the hilly districts of the north is made easy by two valleys tributary to the Manawatu (*Fig.* 2). But to the northwest and southeast of Wanganui the coastal plain is reduced to a narrow strip by the steep hills of the dissected interior which rises on the east as a formidable barrier. Some forty miles northwest of Wanganui is the southern fringe of the uplifted coastal plain of Taranaki which surrounds the extinct volcanic cone of Mt. Egmont. New Plymouth lies on the northern edge of this lowland. Twenty miles due east of this city, however, the undulating surface of the Taranaki lowlands is bounded by the northern part of the dissected uplands of inland Wanganui-Taranaki—here, as further south, these form a large and complex series of steep ridges and narrow valleys which is a barrier to transport east and north.[1]

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*The fieldwork upon which this study is based was made possible by a grant from the Research Grants Committee of the University of New Zealand to whom grateful acknowledgement is made.

Palmerston North has a good site as well as location, for the town occupies four wide river terraces of varying size but of uniformly slight elevation on the western bank of the Manawatu River. At New Plymouth the fringing cliffs of the low plateau are broken by the most extensive stretch of open beach on the Taranaki coast. The land rising to the south of the beach has a gently undulating surface etched by three small streams and their several tributary creeks. Wanganui is least favoured by its site. It consists of a flat valley floor of restricted area and swampy nature and of the undulating surfaces of two fringing terraces.

Wanganui's Early History

The oldest of the settlements is Wanganui, the site of which was purchased from the Maoris by the New Zealand Company in May 1840. The environs of the present city were occupied at that time by several temporary Maori villages, the principal one being on the southern side of the river towards its mouth. The Wanganui Valley was an important centre of Maori population in the early 1840's.[2] For these indigenous people the river was a means of transport, its fertile banks were planted in wheat and kumara, its high walls were sites for pas, and the fish from the river mouth supplemented their diet. In the period before European settlement it was fisherfolk of the tribes up-river who used the land adjacent to the river mouth as a site for temporary dwellings.

Wanganui was selected as most suitable for an outlier of the Wellington settlement because the river was sufficiently deep and wide to

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[1] See W. B. Johnston: 'The Development of Communication Lines across the Taranaki Uplands', *N.Z. Geographer,* Vol. 6, No. 2, October 1950, pp. 171-189.

[2] It is recorded that there was 'a pa or village nearly every half-mile for a great distance up river.' See T. Downes, *Old Whanganui,* Hawera, 1915, p. 211.

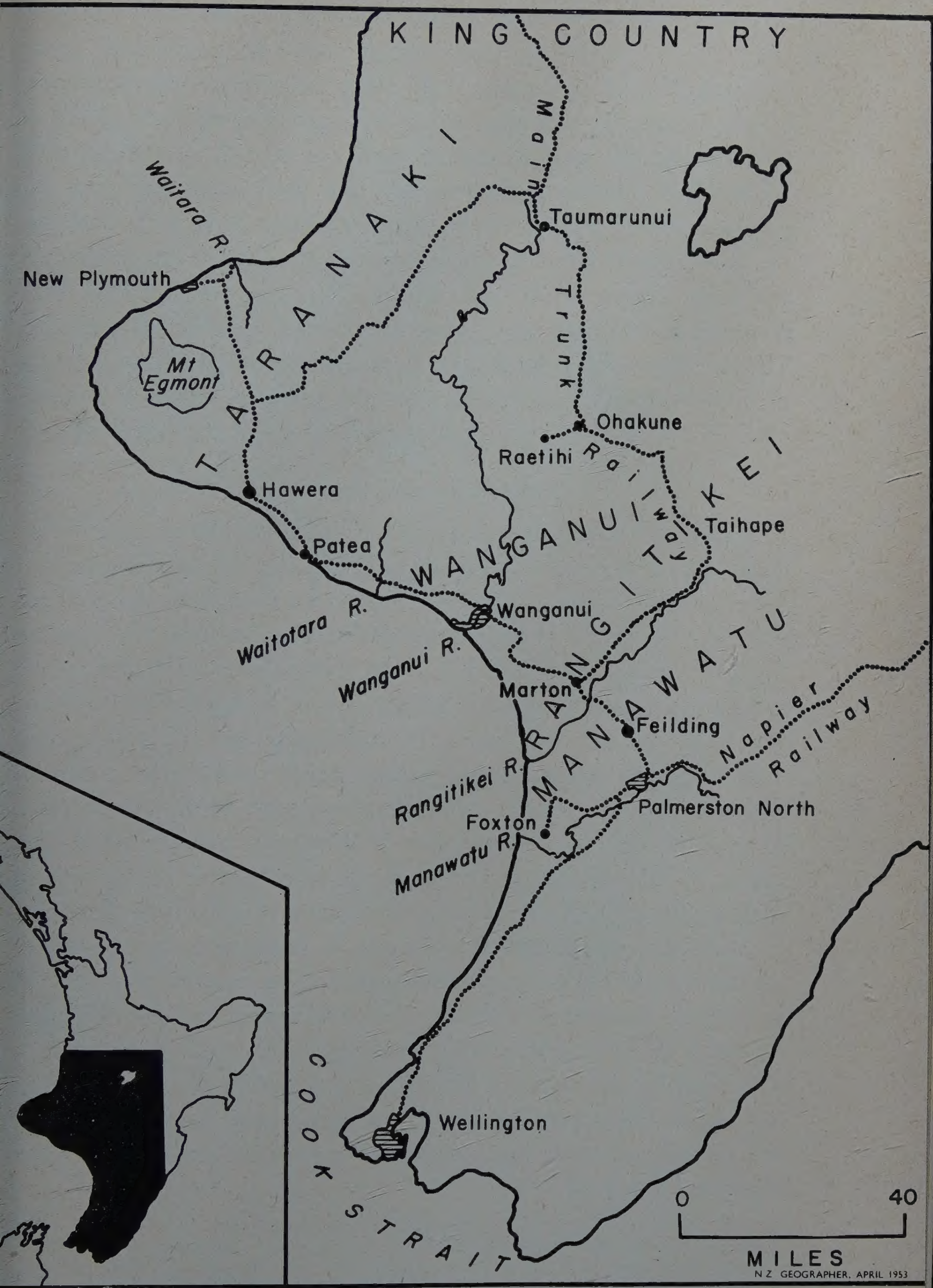

Fig. 1. Location map, showing rivers, railways (broken lines) and principal urban centres.

allow of its use as a harbour, a feature of great importance in a country where dense and largely impenetrable forest made overland travel impracticable and on a coast where other natural harbours were completely lacking. It was also attractive as a well-populated source of food supply. The period 1840 to 1848 was one of foundation, slow growth and military settlement, for war soon developed over the purchase of land (*Fig.* 3). So bad had conditions become in 1848 that the Governor of New Zealand proposed to abandon the settlement and some emigration did take place.[3] The settlers who stayed were rewarded in 1846 and 1847 by the construction of military stockades. The first function of the village, however, was to provide the settlement at Wellington with pigs, pork and potatoes, so that Wanganui was initially a trading post. The total population in 1848 was only 156.

EXPANSION AND PROSPERITY

Wanganui entered upon a period of rapid growth in 1849 which lasted until 1881, for the Maori wars in Taranaki did not closely affect life in the river village, while the demand for food from the southern goldfields during the 1850's and 1860's brought a measure of prosperity to the growing township. The river bridge for road traffic to the south bank was opened in 1871 and the railway bridge further upstream was completed six years later. The following year the railway line from Foxton to Wanganui was opened and the town became increasingly important as a market centre and river port. From 1882 to 1891, however, the growth of population in Wanganui was very slow. The expansion that did take place was due in large part to the growth of dairying not only locally but also in Taranaki, for the lack of suitable ports in the northern district was a gain to Wanganui. A small-gauge railway was laid between the borough and its outport of Castlecliff in order to facilitate this coastal trade. Wanganui was favoured as a market town by its early establishment and by the lack of other towns of appreciable size between New Plymouth and Wellington. A large region was thus served by the town.[4] Adjacent to the town a wharf had been constructed, while harbour development at the outport had commenced in 1875.

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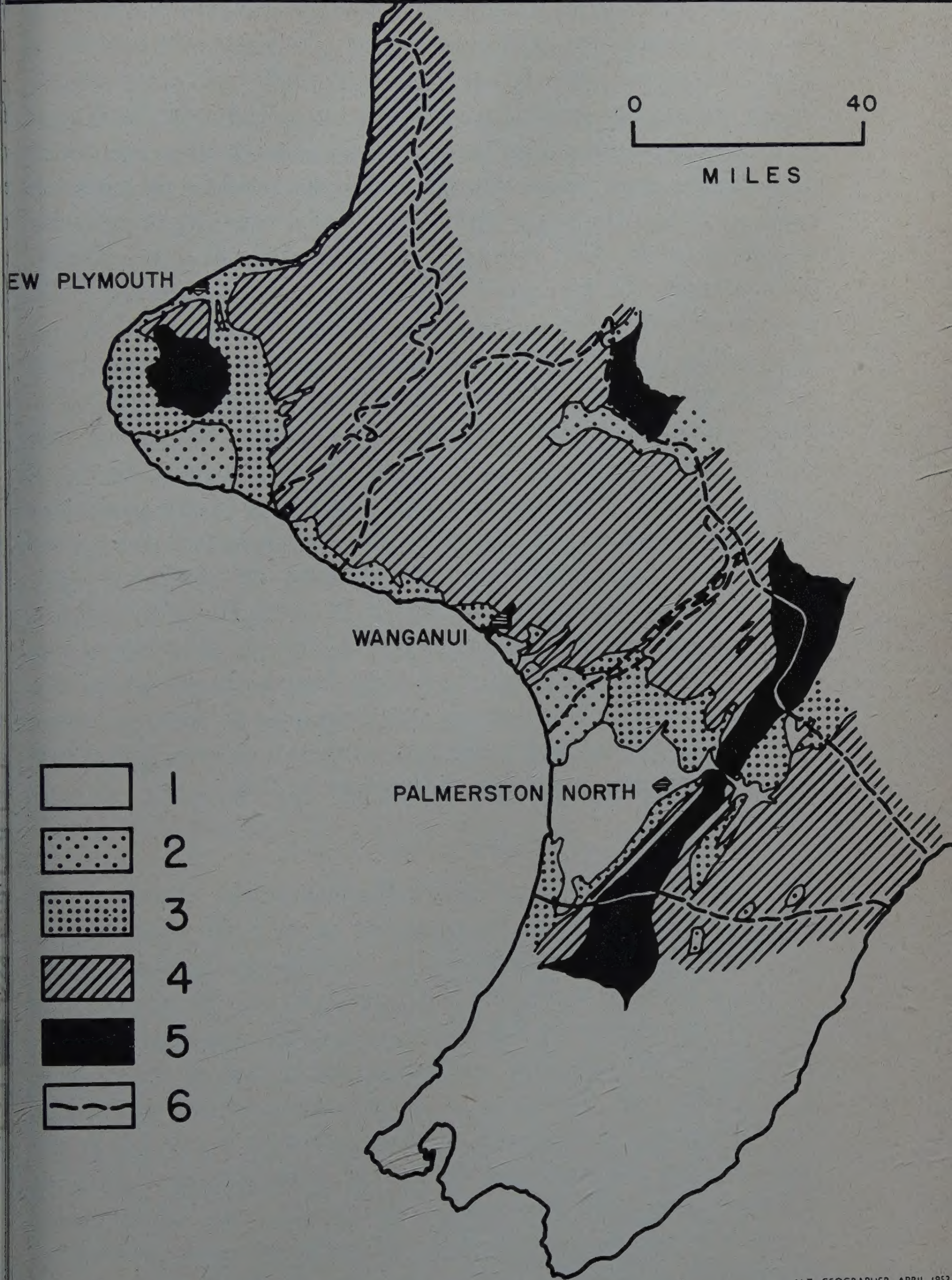
[3] C. J. B. Chapple and H. C. Veitch: *Wanganui*, Hawera, 1939, p. 52.

[4] In 1885 this region extended from the Waitotara Valley, twenty miles north of Wanganui, to Marton on the south. It was from ten to fifteen miles wide but extended inland along the Wanganui River as far as Taumarunui. Between Taumarunui and Wanganui riverboats carried travellers and supplies with sufficient regularity to enable branch shops of Wanganui businesses to be located in the interior village. See R. W. Pownall, *Illustrated Guide to the West Coast of North Island, N.Z.*, Wanganui, 1885.



N.Z. GEOGRAPHER, APRIL 1953

Fig. 2. Surface configuration: 1. Low—little slope; 2. Low to rolling; 3. Rolling to steep; 4. Hilly to steep; 5. Mountainous; 6. Boundaries of tributary regions.

The period from 1895 to the depression of 1929 was one of prosperity and rapid growth for Wanganui but one in which the uplands of inland Wanganui were slowly cleared of their bush cover and in which vast areas of protective forest were fired and only the charred remnants of the bush and the fresh greenness of exotic grasses remained to clothe the steep ridges. Up the valley the residents of the town could see the smoke by day and the glare of the fires by night as the denudation of the land continued throughout the first two decades of the century. To this rugged country, with its soft underlying mudstone, came new settlers and returned servicemen from the first World War, and by the early 1920's wool and mutton were being transported to Wanganui in great quantities. But not all the wool and meat produced within the tributary region passed through Wanganui.[5] Port facilities were constructed at Castlecliff. A meat-freezing works, a woollen mill, a fertiliser works, railway workshops of the New Zealand Government, several wool stores and other industrial plants were opened as the boom period continued. In 1924 the borough amalgamated with the independent town districts of Castlecliff and the western suburb of Gonville to form the city of Wanganui. The cost of this amalgamation was to be high, for the city boundaries now enclosed a large and incompletely settled area extending some six and a half miles from west to east and three miles from north to south, much of which was open land and, even worse, swamp and sandhill.

CHECK TO GROWTH

The depression of the 1930's struck Wanganui most severely; it was to cause the lowest ebb in the prosperity of the town since 1848; it also caused a loss of population (*Fig.* 3). The fiasco of the Matipo Land Company boom at Castlecliff had been a disaster for many small investors; the schemes for the development of the port had been both expensive for the ratepayers and impractical because of the physical nature of the river; farmers on the poorly-endowed marginal land of inland Wanganui were forced off their properties by the fall in the prices of wool and meat; and the transfer of the railway workshops to Petone precipitated an economic crisis for the town. Undoubtedly a basic cause was the poverty of the tributary region, accentuated by deterioration as the early fertility was lost and the inability of that area at a time of low farm incomes to support the workers in the large number of primary processing industries and tertiary services in a city of this size. Wanganui suffered, too, because of its location away from the main transport arteries of the North Island, the uneconomic size of its administrative area, the inadequacy of its river as a modern port, and its top-heavy industrial structure. The result was economic blight, and in the business and industrial part of the city vacant buildings became typical features.

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[5] For specific details see J. Luke: *Wanganui City: Its Location, Growth, Form and Function,* unpublished thesis presented for the degree of M.A. in the University of New Zealand, 1942, p. 42.

POSTWAR RECOVERY

The second World War was followed in all parts of New Zealand by a steep rise in the price of wool and by a resurgence of industry. The new period of industrial expansion for Wanganui was the result not so much of the supply of local labour alone as the availability of industrial premises at a time when a shortage of building materials and government restrictions on the construction of new premises prevailed throughout the whole country. As a result, by 1952 Wanganui appeared to have recovered completely from the effects of the depression of the early 1930's; the buildings in the business and industrial part of the city were no longer empty but were occupied now by branch factories of the new footwear, electrical, floor-covering and clothing firms. Not all signs of urban blight, however, had disappeared from the industrial areas, and some people still felt uneasy as to the solidity of the economic foundations of the town.

FOUNDATION OF NEW PLYMOUTH

Nine months after the purchase of Wanganui the Chief Surveyor of the Plymouth Company commenced laying out the town of New Plymouth. In spite of the fifteen pas situated near the foreshore and the ample signs of Maori cultivation, only twenty natives were living in the neighbourhood at this time.[6] As at Wanganui the natural fertility and gentle surface of the land were primary factors considered in deciding the general location of the new settlement, but the necessity for having a harbour was the major factor in the selection of the specific site. After the rivers of Taranaki were found unsuitable as ports—a discovery reinforced by the dampening experience of the

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[6] A. S. Thomson: *The Story of New Zealand,* London, 1859, p. 46. Thomson estimated that altogether only ninety Maoris were living in Taranaki as a result of intertribal warfare between Taranaki and Waikato tribes.

Chief Surveyor during his first visit to the Waitara River—the naturally protected beach near the Sugarloaf Islands was finally decided upon.

For New Plymouth 1841 to 1860 was a period of urban and agricultural settlement and arable farming. Earp records that 'New Plymouth, though a small settlement in comparison with others, was the first in New Zealand not only to feed itself, but to export its own produce. While the commercial settlements of Wellington and Auckland were importing corn from Sydney and the West Coast of South America, New Plymouth was exporting corn to both.'[7]

By 1848 the village had more than seven times the total population of its older neighbour, Wanganui. This was not only because of the Maori disturbances to the south but also because New Plymouth received 920 settlers on the first ships of the Plymouth Company. But in 1860 war over the question of land broke out in Taranaki and New Plymouth became a military encampment. The war was disastrous for Europeans in Taranaki; farm lands were abandoned, farm houses were destroyed, troops and refugees crowded into the village and the normal life of the settlement was crippled. Many settlers left in accordance with instructions from the government and in 1870 only nine hundred people, more or less, remained in the township.

Consolidation

From 1872 to 1881 New Plymouth assumed the characteristics of a market town and transport terminus for the tributary areas which were being cleared rapidly of their forest now that the wars were over. Throughout this period butter was a trade commodity, and the advent of refrigeration in 1882 hastened the transformation of the lowlands from luxuriant forest into pastoral land. During the 1870's the construction of a railway link with the south continued and by 1881 the southernmost part of the tributary region had been reached with the completion of the New Plymouth to Hawera section of the line. Four years later the butter, the fungus for the China trade, and the timber of Taranaki could be railed to Wanganui. New Plymouth was now a thriving market town marked by a rapid expansion of its population over the past nine years. The construction of port facilities was also commenced during this period, for with the advent of dairying and

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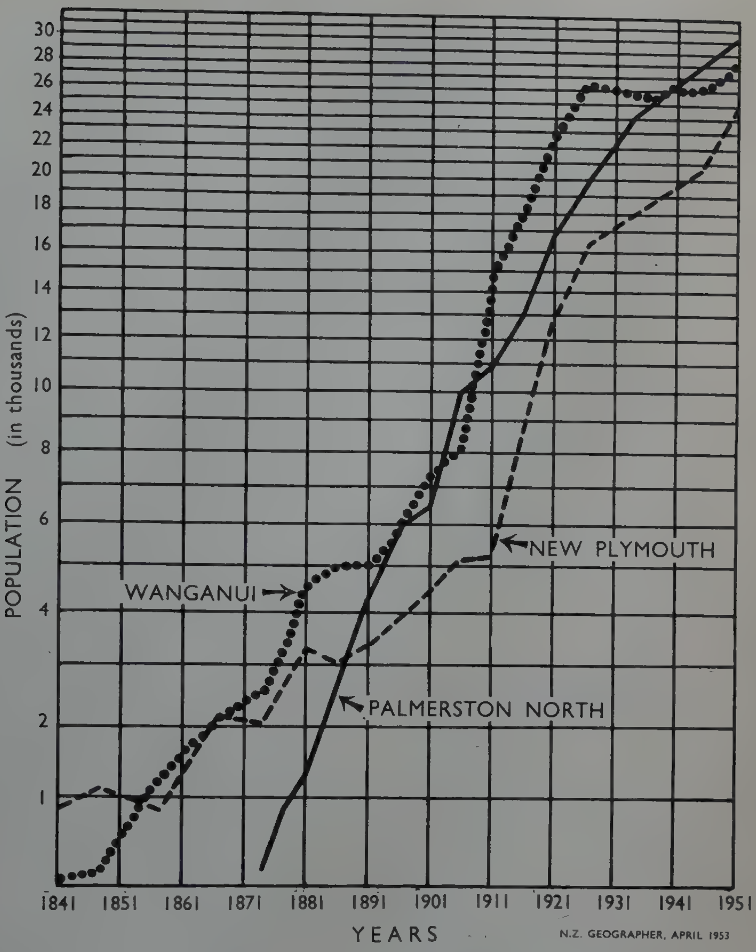
[7] G. B. Earp: *Handbook for Intending Emigrants to the Southern Settlements of New Zealand,* London, 1849, p. 164.

. 3. Population of
anganui, New Ply-
uth and Palmerston
rth, 1841-1951.
pulation by urban
as as defined in the
sus, 1926-1951.)



N.Z. GEOGRAPHER, APRIL 1953

refrigeration Taranaki embarked on an era of prosperity probably unrivalled in New Zealand by any other district at that time.

With the lowlands under cultivation a new generation of settlers turned towards the forest land of upland Taranaki, much the same sort of soft mudstone and of steep ridges and gorges which extended southeast into the inland district of Wanganui. Here in Taranaki, however, settlement was largely peripheral; no large river afforded a means of access to the interior and penetration was at a slower rate than in the south. Butter and cheese, not wool and mutton, therefore, remained the staples of Taranaki down through the long boom period from 1886 until 1929, although the opening-up of some of the inland districts after the first World War did increase the output of the latter products. During this period New Plymouth gained in importance because of its position as the rail terminus on the Wellington line and the southern port on the passenger shipping service between Taranaki and Auckland. But the opening of the main trunk railway through the interior of the North Island in 1908, by-passing both Wanganui and New Plymouth, ended this coastal service.

CONTINUED GROWTH

The economic depression of the 1930's merely slowed for a time the rapid growth of New Plymouth, but fundamentally the lowlands of the tributary region were a rich area and the borough continued to gain steadily in population (*Fig.* 3). The increasing use of the motor car brought more and more townships within the trading area of New Plymouth, the opening of rail and road connections to the north and northeast stimulated this development, and the port function became increasingly important to the town and its district. The fertiliser works and marine foundry, among other industrial establishments, indicated only the most obvious relationships between the town and its region for the wool, butter, cheese and meat of much of Taranaki also passed through the port to the economic advantage of the town. The post-war development of decentralised industries was not especially favoured at New Plymouth by a residue of untenanted buildings left from the depression, but in spite of this the growth of New Plymouth after 1945 was faster than that of Wanganui.

PALMERSTON NORTH'S LATER ORIGIN

Palmerston North was not established until 1870, thirty years after the founding of Wanganui and New Plymouth. Within seventy years it was, however, to outstrip completely its older neighbours (*Fig.* 3).

The plain of the Manawatu River with its almost impenetrable cover of bush and its susceptibility to flooding had long remained unoccupied. In 1846 a clearing of some 900 acres was first discovered by a European and it was here that the town was later sited. Unlike both Wanganui and New Plymouth this settlement was not founded by a company specially incorporated for the purpose but was developed by the New Zealand Government, the first sale of land being made in 1869.

Transport lines were vital to this settlement and the establishment of a coach service through the Manawatu Gorge in 1875, the completion of the tramway through the forest to the port of Foxton, and the commencement of a second coach service to Wanganui soon emphasised the nodality of the new town, a feature which was always to distinguish it from its neighbours. But in the 1870's Palmerston North was essentially a bush village and mill town for it virtually depended upon timber for its existence. As the forest was cleared of millable timber, fire was applied in autumn to the remaining vegetation. In this manner the plain surrounding Palmerston North was slowly cleared for arable and pastoral farming.

In addition to working in the bush, settlers were also employed on public works initiated by Vogel—the making of roads, the construction of railway lines, and the building of bridges. Since the opening of the tramway between Palmerston North and Foxton the township had been an overnight stop on the Wanganui to Wellington coach route, but the replacement of the tramway by railway lines, and the extension of the railway to Feilding in 1877 and finally to Wanganui in 1878 made this stop unnecessary. However, transport was to continue to play a major role in the growth of Palmerston North.

Road and Rail Centre

Although the main trunk railway from Wellington had been started under the Grey ministry a change in government brought about a cessation of work. A private company was registered in 1881 and received an endowment of 215,000 acres in the Manawatu towards the cost of construction. As a result the company decided not to by-pass Palmerston North in favour of a shorter route to the north via Foxton but instead to cross its own land. Thus, Palmerston North came to be located on the main trunk railway while Foxton withered at the end of its branch. For Palmerston North an equally fortunate stroke of luck was the inability of settlers to proceed with the formation of the railway line to the east coast when instructed, for the route was planned to use as its junction a small rural settlement six miles to the northeast of Palmerston North. By the time work was commenced the Wellington line had been completed and Palmerston North became the logical junction for the east coast. These fortuitous events gave Palmerston North in 1891 rail and road links with Wanganui and New Plymouth, with Napier through the Manawatu Gorge, and with Foxton and Wellington. The borough was now an important transport node as well as a market town of increasing importance.

Throughout the period from 1881 to 1929 the growth of Palmerston North continued steadily as low-lying areas of the plain were drained, as stopbanks were erected along the rivers, and as the hill lands to the north were gradually cleared of their forest. To an even greater extent than at either Wanganui or New Plymouth the motor car brought an increase in trade to Palmerston North at the expense of neighbouring townships. The widening of the road through the Manawatu Gorge and the sealing of road surfaces brought rural districts on the east coast as well as those on the west within the tributary region of Palmerston North and the town became the regional focus for a rich pastoral district. Not only were industries concerned with the processing of primary produce attracted to this town but surplus capital from within the town and district was also invested in textile and service engineering industries.

Continued Growth

Because of the relatively even balance between commerce and service industries in Palmerston North and as a result of the productivity of the tributary areas the depression of the 1930's had no lasting effect on the growth of the town. From 1930 Palmerston North continued to attract business from the smaller centres in competition with Wanganui; even the townships and farmlands of the Rangitikei Valley, which had been historically tributary to Wanganui, now shared their business with Palmerston North—a process which might be described by analogy with a river as the 'capture' of a tributary region. This was partially due to the interest which farmers took in the large weekly stock sale at Feilding, twelve miles to the north of Palmerston North. A farmer might attend this sale and shop in Palmerston North in the course of the same day. From these weekly visits shopping habits probably developed in favour of Palmerston North, for the stock sales at Wanganui were only a minor attraction to farmers in the Wanganui region. An additional cause of this capture was the easier grade of the roads which connected Palmerston North to the border areas of Rangitikei by contrast with those to Wanganui.

Before 1939 Palmerston North had increased the number of its industries although they still retained an emphasis on servicing agricultural machinery and the manufacture of textile goods. At the conclusion of the second World War and during the period of prosperity which followed, this city attracted many entrepreneurs who were aware of the advantages offered by the abundance of flat land for building sites, the location of the city on railway lines to the north, south, and east, and its proximity to the large overseas port of Wellington, eighty-nine miles to the south. By servicing the farm lands of its tributary region Palmerston North would probably have been sufficiently prosperous; the steady growth of new industries and commercial enterprises merely underwrote this prosperity so that the city emerged after seventy-five years as a compact urban area, a focal point for new commercial and industrial developments and the largest city between Hamilton and Wellington.

Conclusion

The rate of growth of New Plymouth has not run parallel to that of its tributary region but has been affected by several other considerations, three of which have diminished the importance of the town as a regional centre and three which have accelerated its rate of development. First, the growth of smaller market towns siphoned off some of the trade from New Plymouth; second, the investment of capital by several of the cooperative dairy factories of south Taranaki in the port facilities at Patea was responsible in the past for diverting considerable quantities of cheese and butter through the small river port; and third, the advent of the motor car, which increased the influence of New Plymouth as a trading centre, was partially offset by the disadvantageous location of the city on the northern margin of the richest and most intensively settled part of Taranaki. It is understandable, therefore, why Hawera, at the southern end of the plain, has become the second town of Taranaki in competition with its neighbours and with New Plymouth, forty-five miles to the north.

At the same time the early start which New Plymouth had over its neighbours enabled it to develop those urban functions of administration, distribution and industry which appear to concentrate in the largest town of a region. Moreover, the recent development of the harbour for coastal and overseas shipping has not only resulted in an expansion of normal port activities as well as the processing of imported agricultural phosphates, general engineering and the construction of wool stores, but has also funnelled some of the trade from the southern King Country and south Taranaki through the port of New Plymouth. This development has been associated contemporaneously with the decline of Patea as a port. For these major reasons the growth of New Plymouth has not been proportionate to, or in step with, the development of the Taranaki region.

Unlike New Plymouth the city of Wanganui shares its economic region with only two towns of appreciable size, Marton and Taihape, both of which lie on the eastern fringe (*Fig.* 4). Wanganui has been handicapped not so much by the competition of its subregional market centres as by transport problems. The most important of these arises from the construction of the main trunk railway through the interior of the North Island and not along the west coast. As a result, areas in the eastern and northern parts of the region are not provided with

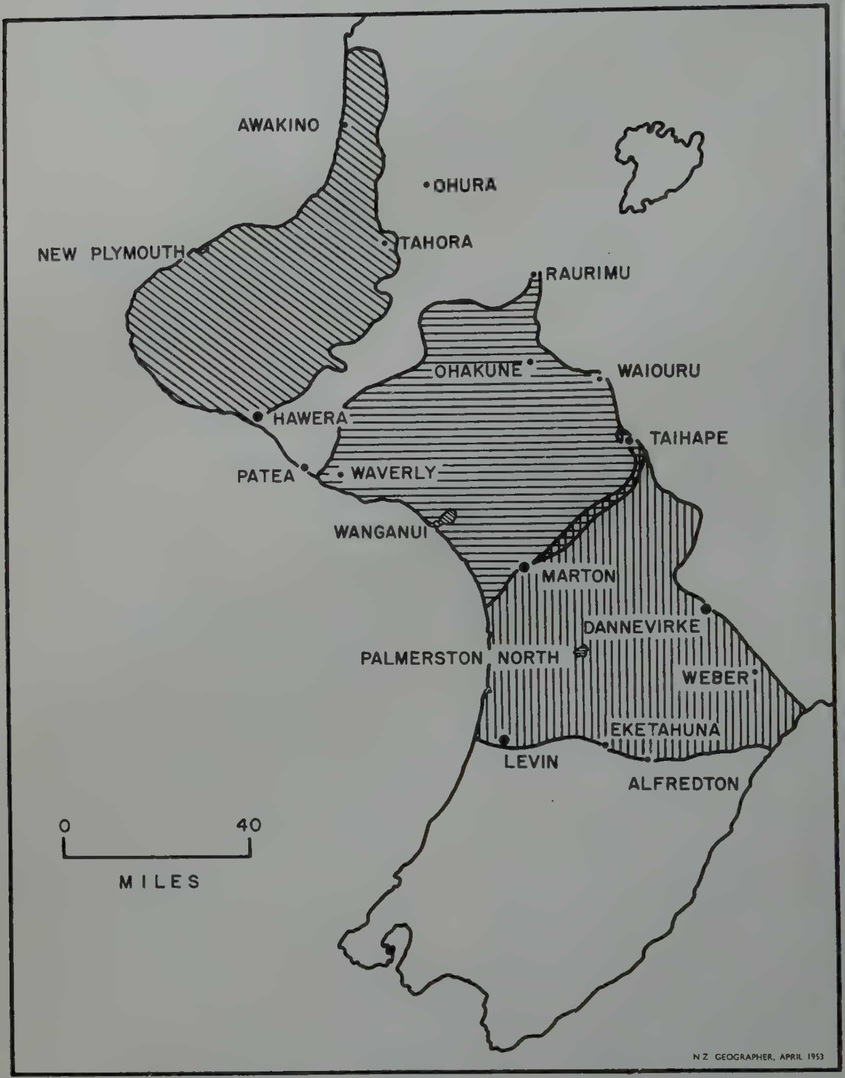


Fig. 4. Tributary regions of New Plymouth, Wanganui and Palmerston North.

direct rail connection to Wanganui and some trade is captured by neighbouring centres.[8] The increasing production of the interior hill lands did not foster a corresponding increase in the trade of the port or in the number of sheep slaughtered at the local freezing works. This situation has been partly caused by the second transport problem —the inadequacy of Castlecliff as a port; but even had adequate harbour facilities been developed at the river mouth, the location of the town twenty-seven miles away from the main trunk railway would still have been a major handicap to the city. Wanganui has also suffered from the notoriously poor conditions of its road connections with the interior, because of the absence of suitable materials for roading and the nature of the soft mudstone strata. As a result of these difficulties arising from both site and location features, Wanganui appears to have grown almost in spite of, rather than as a result of, the growth of much of its tributary region.[9]

Palmerston North, to an even greater extent than New Plymouth, has faced the competition of neighbouring market towns for the trade of Manawatu farmers. In the New Plymouth region 15,800 people live in urban areas outside the city, 8300 live in towns of the Wanganui region, while 17,700 are urban residents in the tributary area of Palmerston North. With the increasing use of cars the trade area centred on Palmerston North has expanded until now the city challenges Wanganui on the west coast for the trade of the Marton and Taihape districts, and Hastings and Napier on the east coast for the business of Dannevirke (*Fig.* 4). Even with this expansion no large urban area within the economic region is more than thirty-three miles from Palmerston North because of the central location of this city—its greatest asset and the prime factor in its development. The boundaries of this region include lowlands of greater area but of lower average productivity than those of Taranaki, but the hill and valley lands within the region have easier surfaces and a higher carrying capacity than the uplands of either the Wanganui or New Plymouth regions.

Palmerston North has also been favoured in its growth not so much by the development of its tributary region as by those circumstances of chance and political manoeuvring which early made this town a vital centre in the railway network in the North Island. This alone would not have been sufficient to ensure the continued growth of Palmerston North, but the nature of the site favoured the development of a compact city area, with a consequently lower rating than at either Wanganui or New Plymouth, at the same time as it offered ample space for physical expansion. Coupled with its sustained rapid growth has been the concentration here of those activities which have already been noted as gravitating to a regional centre.

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[8] The comparative isolation of the Ohakune-Raetihi area from Wanganui is shown by the fact that the New Plymouth morning newspaper is read at both these towns and some fresh foods are supplied to this area from Taranaki by way of New Plymouth and Taumarunui.

[9] By contrast with the 46,200 people in the tributary region of New Plymouth only 27,800 are found in the Wanganui region, a striking reflection of the infertility of the greater part of this large area.

Town and Region

A study of these three towns suggests that the role played by a tributary region in the life of a town may be measured in part by the ratio between the total number of people in the tributary region and the total population of the town. A comparison of the population ratios of each of the three cities reveals that in Wanganui there is only one person in the tributary region for each individual within the city, while in Palmerston North the ratio is two to one, and at New Plymouth the ratio is over two and a half to one.[10] Even without the loss of trade in the marginal areas as a result of the competition of other major regional centres, Wanganui appears to exist almost apart from its region, New Plymouth appears to be closely associated with a large rural population and Palmerston North occupies a position intermediate between the two. Although little competition is offered Wanganui by other towns within its tributary region, this gain probably does not outweigh the implications of the low ratio existing between the population in the Wanganui region and in Wanganui itself.

From this investigation the assumption that the growth of a town reflects closely and in detail the development of its tributary region would appear to have only the broadest application. At best it is merely a general assumption, an hypothesis which must be tested and the degree of its truth measured for each new situation; it should not be accepted as anything more. Nor can it be held that all towns are equally dependent upon their rural areas for support. The extent to which towns vary in this respect may, however, point significantly to the soundness of at least a part of their respective economic foundations.

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[10] Statistics relating to population in the tributary regions are based upon the study of the county mesh sheets of the 1951 census at the Department of Census and Statistics, Wellington. The boundaries of the tributary regions were determined by fieldwork during January and February, 1952.

OTAGO IN 1871: LIFE AND LANDSCAPE

MARY KIBBLEWHITE

IN 1871 the province of Otago occupied all the southern third of the South Island of New Zealand. It contained nearly 25,000 square miles of mountain and valley, plain and downland. To the north, the Southern Alps and the braided course of the Waitaki River from Lake Ohau to the sea formed not only a well-defined administrative boundary but also a formidable barrier to trade and general intercourse by land with the Province of Canterbury.

In the physical elements of its landscape the area exhibited a striking diversity. Ranging from the southern extension of the great highland backbone of the South Island to the flat and swampy plains of Southland, the landforms of Otago revealed neither orderly arrangement nor any degree of geographic unity. Apart from the Southland Plain, near-flat lowland was restricted to river floodplains such as the Taieri Plain, or to intermontane basins such as the Maniototo. Along the east coast lay a narrow belt of downland, and in the far southwest the mountainous and intensely-glaciated area of Fiordland.

The climate of the province was distinguished by wet western and southern coasts and much drier interior and northern sectors. The size and position of the mountains to the west tended to create a concentration of precipitation on the west coast, westerly winds deflected around their southern extremities carrying humid conditions along the southern coast, while in the interior their rainshadow effect gave rise to a climate virtually continental in character.

THE VEGETATION

Whatever the original vegetation, that which was found in Otago in the years of exploration and survey, 1835-1855, consisted of two main categories, a forest and a grassland association, with less significant areas of scrub at higher altitudes and subalpine and alpine shrubs and grasses. In the west and south lay a wide area of lowland forest dominated by members of the podocarp family, while at altitudes of 1000 to 2000 feet, depending on conditions of slope and exposure, this was replaced by the mountain beech forest association. Above 3000 to 4000 feet the beech forest gave way in most areas to subalpine shrubs, mainly *Hebe* and *Compositae,* merging gradually into the alpine herbs of the mountain meadows, moors and shingle slips. In the interior and northeast of the province were wide areas of tussock grassland remarkable for its uniformity of appearance and providing shelter for a thick mat of grasses, herbs and sedges.

By 1871 the advent of a large number of settlers had caused certain changes in the natural vegetation, though large areas, especially at higher altitudes and in the west, remained entirely unaffected. The most accessible and useful forests, notably those around Otago Harbour, on the Southland Plain, in North Otago and at the mouths of the large rivers were first to be depleted either by cutting or by deliberate or accidental firing. Areas of tussock grassland in the interior had suffered some change especially where the operations of gold miners had strewn long stretches of the river valleys, terraces and mountain sides with the gravel and sand of their tailings.

Historical Setting

The development of the Province of Otago from the first European settlement, a sealing camp established at Dusky Sound in 1792, to the rich and flourishing community of the 'seventies may be summed up in the words 'sealers and whalers, Scotsmen, sheep and gold'.

By 1820 sealing had been replaced by bay-whaling, and with the setting-up of shore-whaling stations came the first attempts both by Maori and European to cultivate small patches of ground for the growing of vegetables and grain. Following a period of exploration, survey and land speculation, came the founding of an organised settlement at the head of the Otago Harbour in 1848 under the aegis of the Lay Association of the Free Church of Scotland. The progress of the new colony was slow, the settlers gradually occupying land in a long narrow strip of country from the Waitaki River to Foveaux Strait, and it was not until 1853 that the exclusive nature of the settlement began to change with the taking-up of vast tracts of the interior for pastoral purposes.

By 1860 conditions in the province were extremely favourable; the previous decade had seen the growth of serviceable roads throughout the areas of closer settlement, communication with the interior was possible, a vast increase in flocks of sheep and other stock had taken place, and the export of grain and flour to Australia was increasing.

During the 'fifties reports had come from time to time of small gold discoveries, but the news was received without enthusiasm. However, the lure of gold gathered strength and within a few months after the discovery of Gabriel's Gully in 1861 almost every aspect of the life of the community had undergone a change so profound as to make any return to the peaceful and slow progress of the 'fifties impossible.

As soon as the richest and most easily won returns from one deposit were exhausted it seemed as though a new field were ready and waiting to be exploited—Gabriel's Gully, the Dunstan, the Arrow, the Shotover, and Mount Ida followed one another in quick succession. Gradually the character of the workings underwent a change, alluvial mining on a larger scale being undertaken, and slowly the community adjusted itself to the new conditions. Roads were built across the mountains, townships sprang up to serve and entertain the miners, and farming reached new heights of prosperity under the influence of high prices for mutton and flour. The town of Dunedin found itself unable to cope with the influx of population and for a time became a chaos of tents and shanties.

By the late 'sixties the more solid benefits of the new riches began to make themselves apparent, for shrewd businessmen and practical farmers had come in the wake of the miners. In the decade 1861–1871 the population of the province had increased sixfold and gold worth more than twenty-three million pounds had been won. With the reuniting of Southland, which had had a brief separate existence as a province from April 1861 to November 1870, Otago was once more an administrative whole, a land which still bore the marks of a great upheaval, a prosperous and progressive community whose economic activities matched in their variety the diversity of the natural landscape.

The Otago of 1871 embodied in its personality many of the characteristics of the three main periods of its European history, the period of the 'class settlement', the 'golden decade' and the modern age.

The People

By 1871, twenty-six percent of the population of New Zealand was to be found in Otago: its population, according to the census of 1871 was 69,481. Over an area of 25,000 square miles the people were unevenly spread, for all the land west of the inland lakes was almost entirely uninhabited, the area between the Invercargill-Kingston road and the Waiau River was very sparsely peopled, and the general concentration of population along the south and east coasts was interrupted only in the Catlins district where, apart from small villages at Catlins River and Waikawa, a large area of hilly and forested land was without settlement of any description. Within the interior of the country the population was concentrated in areas where gold was found. The goldfields towns, established to serve a once larger population, formed the foci of agricultural settlement in many cases, while between each small concentration and the next, in a few sheltered valleys among the ranges, were to be found small groups of people engaged in managing and working the large sheep runs. Only along the east coast from the Waitaki River to the Clutha and further south on the Southland Plain did the pattern of population distribution lose its nucleated or isolated character and show a more even spread over the land.

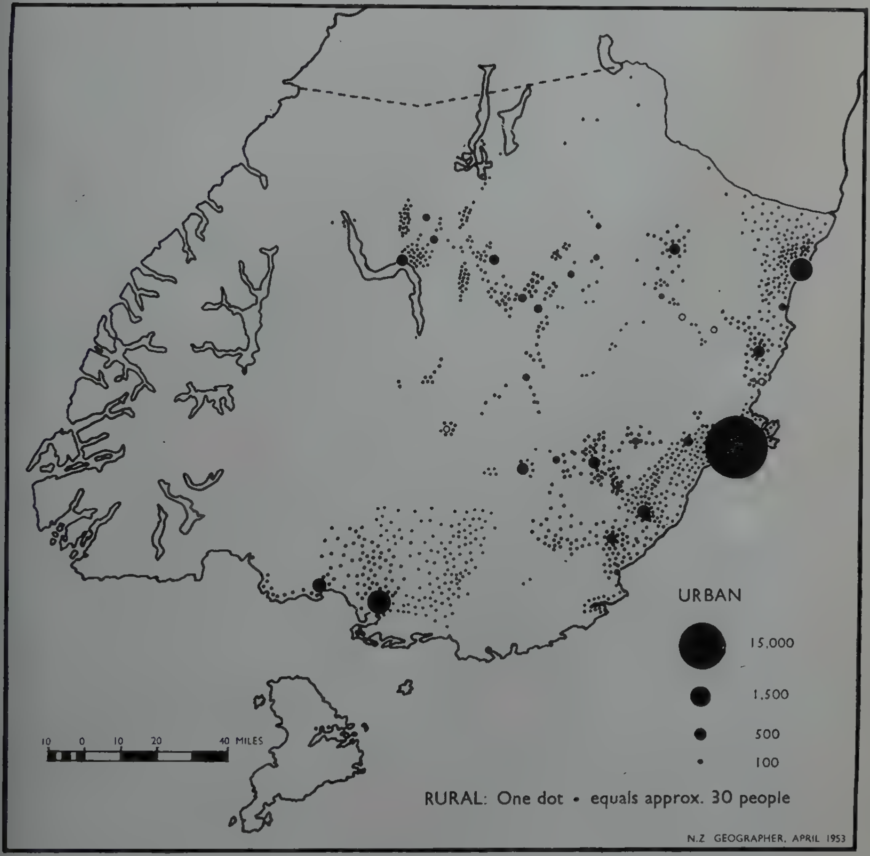
Though it is both impossible and incorrect to assign any exclusive reasons for this pattern of population distribution, it cannot be denied that two factors played a very important part—the distribution, quality and accessibility of the gold deposits, and the system of land sale and tenure established in the beginning by the Land Sales and Survey Ordinance of 1856, whereby the province was divided into three units: a six-mile strip along the coast for small farms; inland, an area broken up into blocks of two hundred acres each; and the land intended for the large pastoral runs in the interior.

CHINESE AND MAORIS

The gold rushes had brought an end to the exclusively Scottish origin of the population, though the non-European element, mainly Chinese and Maori, formed only six percent of the total. The main body of Chinese had come to Otago after the first great gold rushes were over, and having made small fortunes from the treatment of tailings and abandoned claims, some had returned to China while others had become more permanent residents—merchants and traders in the goldfields towns, and market and jobbing gardeners in and around the larger settlements.

The decline of the Maori population of Otago had taken place so rapidly that by 1871 only 612 natives were to be found in the province. The majority lived in eight small native villages along the coast, from Moeraki in North Otago to Colac Bay in the south, on land which they had retained as native reserves. In the interior and on the southwest coast the Maori population was negligible; but while the great majority lived in the coastal villages where they practised a self-sufficient form of agriculture under rather wretched conditions a few were to be found employed as station hands on the pastoral runs or as labourers on roads and railways.

Other distinctive features of the population of Otago in 1871 were that males outnumbered females in the ratio of three to two; the high birthrate of forty-four per thousand; the high rate of infant mortality, one child in every nine dying before it reached the age of one year; and the low proportion of the population (1.6 percent) over fifty-five years of age.



N.Z GEOGRAPHER, APRIL 1953

Fig. 1. The distribution of population in Otago, 1871.

Though the degree of truly urban development at that period was small, nine towns in Otago, each containing over 500 persons, shared between them thirty-three percent of the total population. The significance of this proportion is notably modified by the fact that two-thirds of the urban population (as defined above) and nearly one fifth of the total population lived in the town of Dunedin, the provincial capital. Another twenty-seven percent of the population was to be found in those areas of the interior of the province defined by act of parliament as goldfields, while the remaining third were farmers or villagers in the more densely settled coastal regions.

Town and Village

Outstanding from every point of view among the nucleated settlements of Otago was the town of Dunedin, provincial capital and seat of the provincial government. 'Dunedin is a remarkably handsome town—and, when its age is considered, a town which may be said to be remarkable in every way. The main street has no look of newness about it. The houses are well built, and the public buildings, banks and churches are large, commodious and ornamental.'[1]

Containing a population of 18,500 people and covering an area of just over one square mile with outlying suburbs along the main roads, the settlement formed a narrow semicircular fringe around the bay at the head of the Otago Harbour. The flat area of the town on the immediate waterfront was very narrow—not more than half a mile in width, and by 1871 certain quite extensive areas had been reclaimed. North and west of the town rose steep hills, while to the south extended a long sandy and marshy area from Anderson's Bay in the northeast to the promontory of Blackhead in the southwest.

The street pattern of the town was hinged on one long street—Princes and George Streets—with other thoroughfares extending from it, mainly at right angles in the north, more irregularly in the south. Superimposed upon this pattern was the system of streets round the Octagon, one of the two foci of the town, the other being the Exchange further south.

It is impossible to define with any clarity functional areas within the town, for its rapid growth had caused non-residential buildings to be erected wherever vacant sections occurred, and small blocks of houses to remain in the heart of commercial or administrative blocks. In a very general way the main administrative area of the town was to be found to the south and seaward of the Octagon and the Exchange, the most important buildings and institutions being the provincial government buildings described as 'a massive pile of brickwork', the post office, 'a very grand looking edifice, having a tower and a clock of which the inhabitants seem very proud', the custom house, 'very plain and looks as if it had been built for a prison or a penitentiary', and the gaol, 'a strong, well-arranged commodious building'.[2] Along the waterfront were situated the warehouses and stores, weighbridges and carting contractors' establishments, while the retail shopping area was to be found in two adjoining sectors, a large section of the hill south-west of the Exchange, and the long line of shops on either side of Princes and George Streets.

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[1] Anthony Trollope: *Australia and New Zealand,* London, 1873, Vol. II, p. 342.

INDUSTRIES OF DUNEDIN

In 1871 the industries of the town were small, and scattered over a wide area. They included flour mills, breweries, tanneries, boot factories, timber yards, foundries and others, but all were small in area, labour employed and output. In every part of the town wooden, brick and stone houses were to be found, houses and sections varying in size from the tent sites and cottages of Upper Stuart Street to the mansions and elaborate grounds of Filleul Street and Heriot Row. Throughout the whole area of the town were churches, schools, hotels and cultural establishments of various kinds such as the Athenaeum and the Museum. As well as three main primary schools, one of them free, the town contained secondary schools for boys and girls, an industrial school, numerous small private schools and the beginnings of a university. Concerning hotels, little comment is necessary beyond stating that they numbered over one hundred if Port Chalmers be included.

The town had been equipped with gas, water and sewerage systems since 1863. Though the gas supply was somewhat uncertain, 'the water reservoir [was] a good piece of work and the supply of plenty of pure water throughout the town [was] maintained'. The streets were narrow and generally in poor repair, and the transport system within the town, though surprisingly extensive and frequent, varied in quality from street carriages 'very good and comfortable', to the Albert cars 'the very reverse' and the omnibuses 'near the last stage of their existence'.[3]

In 1871 Dunedin possessed many fine and imposing buildings, an extensive street system and many modern amenities and institutions. In spite of this, however, it presented a rather straggling appearance with its many vacant sections, steep cuttings in the hillside, and patches of bush and scrub not only surrounding but also within the boundaries of the town.

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[2] G. T. Chapman: *Traveller's Guide through New Zealand*, Auckland, 1868, p. 64 ff.

[3] *ibid.*, p. 66.

In the life of the province the town reigned supreme as the centre of government, justice and education, as a collecting and exporting point for the produce of the interior. There, were established the largest warehouses, shops and factories, and eight miles down the harbour, its deep-water port, Port Chalmers, was expanding to become in the 'seventies the shipping and export centre of the south.

Oamaru and Invercargill

Second and third in size and somewhat similar in function were the towns of Oamaru and Invercargill, the former eighty miles to the north of the capital, the latter on the south coast of the province. Though their population (a little over 2500 each) was far smaller, they contained industrial establishments such as flour mills, foundries and tanneries, facilities for retail shopping and the storage of agricultural and pastoral produce, churches, schools and hotels. The remaining urban settlements ranged in size from the largest, Milton, with 977 inhabitants, to Hamilton's, a goldfields town with only 110. On the basis of function and general appearance they could be divided into two main groups, the agricultural towns and the goldfields towns.

The village of Hampden on the coast sixteen miles south of Oamaru with a population of 170 in 1871 was representative of the smaller agricultural villages of the province. In appearance nothing more than an aggregation of wooden frame houses and cottages, each on an acre or more of ground, the village had several important functions as a centre for the surrounding farming community. It contained the local church and school and, perhaps rather surprisingly, three hotels. The retail commercial function was represented by a general store, a baker, two butchers, a draper and three bootmakers, while industry included a flax mill, two carpenters, two blacksmiths and a stone mason. Where the villages were larger, greater facilities for retail trade and storage, and a wider variety of industries were to be found; where they were situated on the coast where anchorage was suitable for shipping, the commercial or industrial function was enhanced.

The remaining group of nucleated settlements, the goldfields towns, had had a rather different history and in consequence possessed a distinctive appearance. A contemporary account of Naseby, the centre of the Mount Ida goldfield, reveals very clearly the characteristics of the goldfields town of the period.

> The town itself is one of the best specimens of a Goldfields town. On all sides, in the streets themselves, round the very church which is perched upon a bit of ground only just preserved sacred from the pick and shovel, there are signs of the destructive miner. Acres of land turned over in all directions and the muddy water of the tail-races running down the main thoroughfares present altogether a curious picture, not the less odd by the funny collection of small sheet iron shanties which for the most part make up Naseby.[4]

Some of the goldfields towns, for example Arrowtown on the Wakatipu field, had altered slightly in character as areas of land round about them were developed for agriculture rather than mining. In such a case the town took on an appearance of greater prosperity and permanence, a grain mill or a tannery was established, municipal institutions were authorised, and an element of civic pride arose.

Thus the towns and villages of the Province of Otago in 1871 showed both variety and homogeneity. They were for the most part small, but contained within them all the industry to be found in the area; and in days of difficult and slow transport and communication they were centres for the collection, storage and distribution of goods and for the limited educational facilities, and they served as social meeting places.

FARMERS AND MINERS

In the life and landscape of Otago in 1871 two occupations, farming and mining, were of paramount importance and provided contrasts in their effect on the geographic character of the province.

Although large tracts were unsuitable for farming of any description because of their configuration, inaccessibility or forest cover, the variety of natural conditions within the area made possible an equal variety in the forms of agricultural utilisation. The most outstanding feature of farming in Otago was the sharp division which existed between the areas of arable (or, to be more correct, mixed) farming and areas of pastoral farming in crops and livestock, markets, size of holding and many other features. The distribution of these two main types was closely related to the land tenure system whereby the province was divided into three main areas, each with rather different land laws —the pastoral runs, the hundreds and the goldfields.

In the pastoral-run country land was held under depasturing licences which were issued for a period of fourteen years, but which had to be surrendered at any time if the land were required for closer settlement. An annual depasturing fee of one penny per sheep also had to be paid. The authorities could at any time declare a portion of a run a 'hundred', thereby throwing it open for sale and settlement. Land in the new hundred would be sold by auction or on deferred payment schemes in freehold blocks varying in size from fifty to 200 acres. In areas declared by law as goldfields the land was not sold outright but leased under certain improvement conditions with a view to preventing monopoly and exploitation. A rent of 2s. 6d. per acre was charged and at the expiration of three years the lessee was entitled to purchase the fee simple of the land at a fixed price of £1 per acre.

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[4] *Mount Ida Chronicle,* 30 January 1874.

The gradual process of declaration of hundreds had by 1871 resulted in a narrow ribbon of freehold settlement from the Waitaki River south to the Clutha River and over the Southland Plain where mixed arable farming—grain, potatoes, hay and turnips, sheep and cattle fattening and some dairying—was carried on. Inland lay the pastoral runs where the land was devoted to extensive sheep farming for wool, with small scattered areas of grain and vegetable growing.

Extensive Pastoralism in the Interior

Pastoral farming in Otago was remarkably homogeneous in character and showed little regional differentiation. Holdings were extremely large—often measured in square miles—and the flocks of sheep depastured on the native tussock grassland were enormous, the six and a half million acres held under depasturing licences supporting 1,777,782 sheep. Absentee ownership and multiple holdings by companies and private persons were characteristic, the run being controlled by a manager and a large staff of shepherds and musterers. Flocks were almost entirely of merino breed, and shearing by large gangs of itinerant shearers was carried out in spring or early summer. A few cattle were kept on the runs, especially where rank scrubby or swampy growth made conditions unsuitable for sheep. Large teams of bullocks and horses were necessary, oats being practically the only crop grown on the estate, though in the lower well-watered country wheat, barley and potato growing were attempted. Each homestead formed an almost self-sufficient community, up to thirty people living permanently in this central core of the run.

In spite of the serious problems of heavy sheep losses due to climate and lack of supplementary fodder, to scab and poisonous tutu, and to the difficulty of access and the general shortage of labour, the export of Otago's golden fleece, until the depression of the late 'seventies, almost rivalled that of her mineral gold.

The farming carried on in the hundreds possessed a considerable uniformity, but some variety was to be found in small areas. Although holdings varied greatly in size, the main crops of wheat, oats, barley, potatoes and turnips, the sowing of permanent grass, the raising of sheep and cattle, and the beginnings of commercial dairying were common throughout the area. Yields varied with natural conditions and the stage of development of the land, but compared very favourably with those of other countries.

Among the more localised characteristics of the mixed-farming region were the concentration on the evolution of new breeds of sheep, and the relatively high degree of mechanisation to be found on the rolling downlands and large estates of North Otago, the cultivation of native flax in the coastal area between Waikouaiti and Dunedin, the specialisation in dairying and the erection of the first cooperative dairy factory in New Zealand on the Otago Peninsula, and the laying down of large tracts of permanent grass by associations of capitalists on the Southland Plain. In 1871 farming in Otago had developed far from the subsistence stage. The pastoralists continued to obtain high returns for their wool, and among the smallholders and agriculturalists an effort was being made to seek a wider market for grain, to develop dairying, and to find some means of disposing of fat stock other than on the local market. The prosperity to which the gold rushes had given rise remained, and had not yet been overshadowed by the depression of the later 'seventies.

Gold Mining

Of all the forms of mining carried on in Otago in 1871, the exploitation of the gold resources of the province far outweighed in monetary value, in number of men employed, in standard of technological development and in degree of impact on the natural landscape, the mining of coal or other minerals. With the exception of the small Orepuki–Longwood field on the south coast all the main goldfields were located in the interior of the province, the actual diggings being scattered thinly through a wide area which included more than one third of the land of Otago. For the purposes of administration within

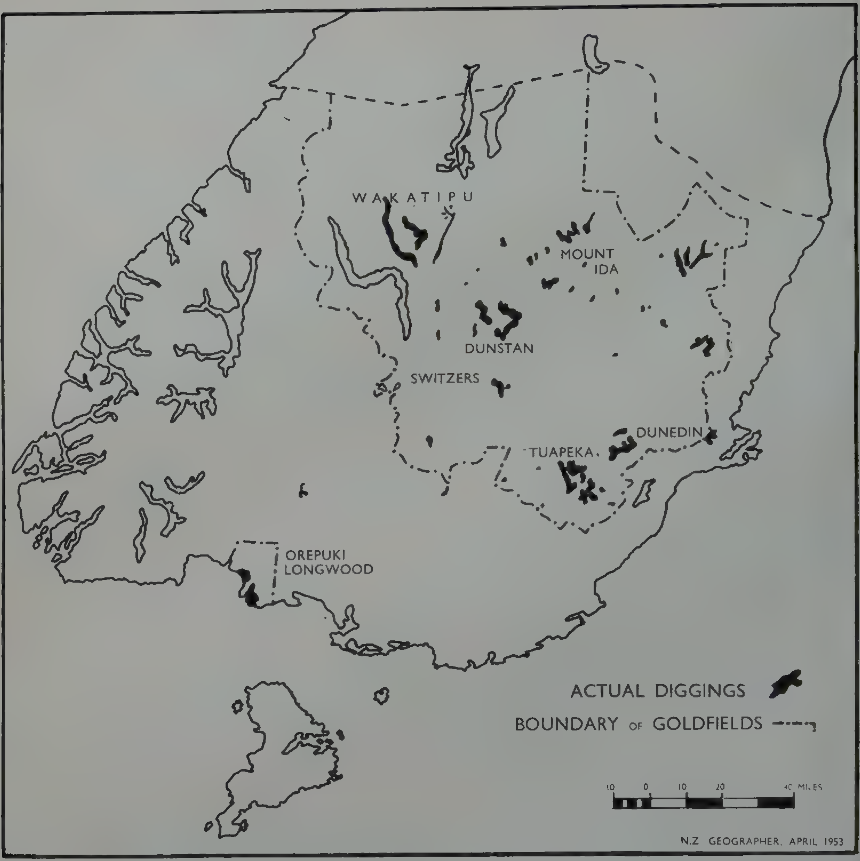

Fig. 2. The goldfields of Otago in 1871.

the general goldfields area, the diggings were divided into eight main groups, the most important of which were Wakatipu, Dunstan, Mount Ida, Tuapeka and Waipori. In spite of the fact that, in nearly all, the whole range of mining methods was employed and the population was similar in quality and distribution, some minor differences did exist, arising from location, geological formation, water supply and climate, and the availability of timber and land for agriculture.

The Wakatipu field was characterised by the largest number of miners, a general inaccessibility and high rugged terrain. The mining operations could be divided into two main groups; the systematic cleaning-up of the creek beds by the Chinese miners and the extensive tunnelling and sluicing by European mining companies, particularly on the rich terraces near Arrowtown, together with the working of quartz lodes at Skipper's Point. Richest in actual output of gold was the Dunstan field which had expanded from a central core around Clyde and Cromwell to embrace a wide area of country where variety of natural conditions provided for dredging on the Clutha, tunnelling and sluicing on the Cromwell Flats, and quartz reefing in the Carrick Range. Because of the more gentle relief, the diggings were separated by areas of agricultural land, the landscape being dominated less by the results of gold mining than in the Wakatipu area.

Even more widely scattered than the Dunstan field, the Mount Ida goldfield included not only the diggings on the Maniototo Plains but also a number of isolated areas in the surrounding high country. Workings were for the most part alluvial, the distinctive process used being 'paddocking'.[5] The Tuapeka area, oldest of the great goldfields, could be distinguished by its general compactness, while at Waipori the trend was in the direction of quartz rather than alluvial mining.

THE MINING LANDSCAPE

Two of the great problems of the gold miner are of significance if only in their impact on the natural landscape—the quest for timber which led to the rapid culling of the forest in certain areas, notably around Lake Wakatipu, and the need for water in an area where rainfall was generally low and where the long water races, necessary in many cases to bring the stream to the site of the mining operations, were frozen over in winter.

It is difficult to overemphasise the importance of gold mining in Otago, not only in the immediate areas where it was pursued, but in almost every part of the province and widely throughout the colony. Gold mining created distinctive and remarkably permanent features, by which the hand of man was deeply imprinted upon the natural landscape. Great mounds of gravel and shingle, clay bluffs cut away and undermined by sluicing, water races and tail races cut deeply into the hillsides, sod huts with corrugated iron roofs, narrow tracks and waggon roads over the mountains—all these were created and remained. In the Otago of 1871 the landscape of the goldfields extended far and wide over the interior, in gullies and pockets and riverbeds; its features are still fresh and prominent among the tussock and rock, deserted and not yet overgrown.

Though the effect of coal mining on the landscape of Otago was of a very minor nature compared with that of gold mining, this economic activity had a considerable influence on settlement, transport and industry in general. The villages of Kaitangata, Port Molyneux and Shag Point owed their existence in great measure to the coal mining in their vicinity; coal played an important part in the coastal shipping of the period, and though wind and water were still important sources of power, particularly for grain milling, the use of steam power for both industry and transport was developing rapidly.

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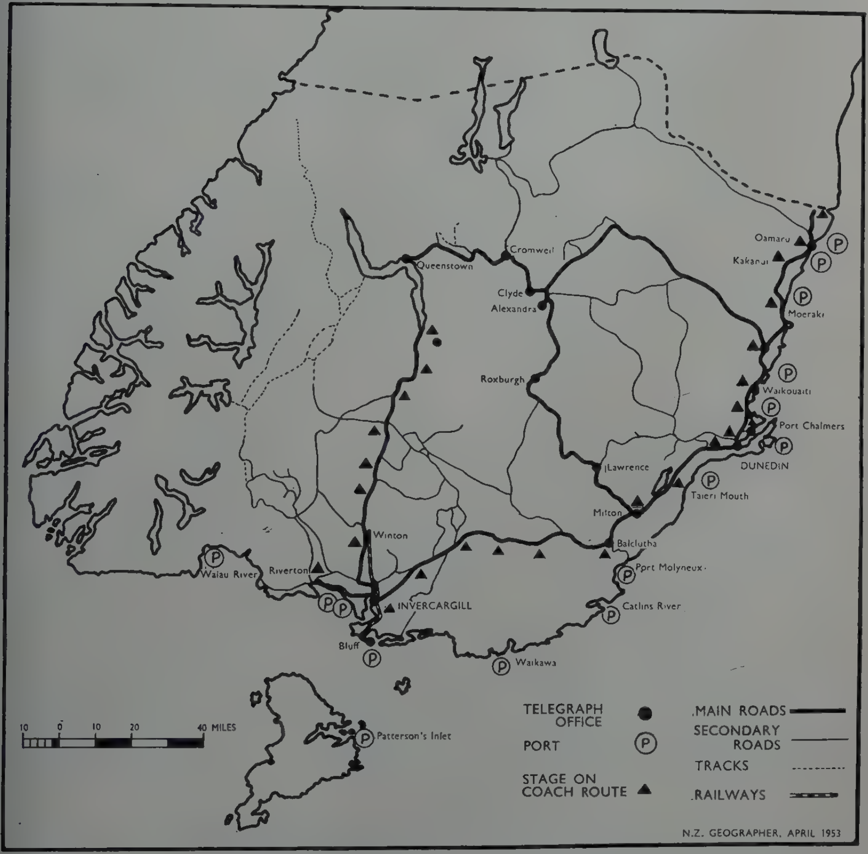
[5] Paddocking was the systematic sluicing of large areas of flat ground from which the surface layers were first removed to reveal the 'wash-dirt' beneath.

Transport and Trade

In view of the obstacles to communication and trade both with the outside world and within the province, it is remarkable that Otago by 1871 possessed such an extensive and adequate pattern of transport routes. The absence of well-protected harbours on the east and south coasts, the complexity of relief, the large and swift-flowing rivers, and the vagaries of the climate, especially in the interior, all created serious problems.

Large quantities of stores and produce moved along a system of three main transverse routes with a linking coastal road, particularly wool and gold from the interior to the coast, and food and other merchandise from coastal ports to inland goldfields and sheep stations. Tributary or alternative routes were few except in the more gentle terrain of the south or of the northeastern downlands, while in the west and northwest they were nothing more than roughly indicated pack-trails. Land transport in 1871 was by coach, waggon, packhorse or on foot, as well as by private facilities such as the runholder's and farmer's horse and buggy, the miner's mule or donkey, and the Chinese wheelbarrow. The movement of food supplies by waggon from the coastal ports to the goldfields had slackened considerably since the early 'sixties owing to decrease in population and increase in the amount of grain and vegetables grown in the vicinity of the interior settlements. On the coast movement of goods was mainly by sea, but inland a waggon and bullock team was constantly in use for the movement of station supplies, home comforts, mining machinery, timber and fuel. Though contemporary accounts vary considerably, the roads were generally in poor repair, particularly in winter when in Southland at least many were rendered impassable by heavy rain for weeks at a time.

While roads were the major avenues of transport and communication in Otago, the year 1871 marks the beginning of the railway era, not only in Otago but in New Zealand as a whole. The Invercargill-Bluff railway, completed after serious financial difficulties, was carrying a daily load of passengers and goods between the town and its port; on the much-discussed Oreti line the warped and worn wooden rails were being replaced by steel, and trains were running three times weekly between Invercargill and Winton; much of the Port Chalmers line was completed, work on the tunnels having been begun, and on 18 March the first sod of the Dunedin-Clutha railway had been cut. Railways were not yet of great economic importance, nor was their presence of significance in the landscape, but railway works had been established and the concentration of population at certain key points in the construction schemes was already taking place.



N.Z. GEOGRAPHER, APRIL 1953

Fig. 3. Pattern of communications in Otago, 1871.

The major part of both the export trade in which the most valuable commodities were gold and wool, and the import trade, which consisted of a great variety of manufactured goods, was carried on with Great Britain and other colonies. Also there was an irregular trade with the United States, China, Mauritius, the South Sea Islands and other foreign countries. In 1871 coastal shipping had not been supplanted or even rivalled by railway transport. Both steamers and sailing vessels of various types called more or less regularly at small ports around the coast from Orepuki to Oamaru. Not only did they transport goods and passengers between the coastal ports but also on the larger rivers and the inland lakes. Evidence of the importance of coastal shipping was apparent in the rapid development in the late 'sixties of small ports such as Kakanui and Waikouaiti.

Thus by 1871 it was possible to visit the main centres of population in the province by coach in reasonable comfort and security; mail services were regular and extensive; all large centres and many small ones had telegraphic communication; and coach, waggon, packhorse, sailing ship and steamer dealt with the transport and trade of the people of Otago.

Certain fundamental differences existed between one part of the province and another. In order to express these differences in their combined effect in the landscape the area has been divided into three geographic regions. These contained within them many smaller areas which were distinctive in themselves, but it has been considered that finer regional subdivision would introduce an element of confusion and defeat the ends of regional division.

The three areas into which the province has been divided are as follows: Western Otago, that is, the northwestern mountains, Fiordland and Stewart Island; interior Otago; eastern Otago and Southland.

Western Otago

Extending along the exposed west and southwest coasts of the province was a region bounded on one side by the sea, on the other by an irregular line from Lake Ohau along the western side of Lakes Wanaka, Wakatipu and Te Anau, in the south along the Waiau River and the Longwood Range. It embraced about one quarter of the total area of Otago.

It was the highest and most deeply dissected region in the province. Its configuration ranged from the 9000 feet of the alpine peaks of the Mount Aspiring Range in the north to the lower, glaciated and rounded surface features of Fiordland and Stewart Island. The climate was characterised by a very high rainfall, heavy snowfall and a great number of frosts, these conditions being closely related to a natural vegetation predominantly of beech forest, with podocarps on the lower seaward slopes and on Stewart Island, and subalpine and alpine vegetation at higher altitudes. But the most distinctive features of the area lay in the complete absence of human activity and may be described in the words 'unexplored, uninhabited, unexploited'. Much of the region remained virtually unknown in 1871, though efforts had been made to find a practicable route to the west coast from the head of Lakes Wanaka or Wakatipu. The country to the west and south of Lake Te Anau was virtually unknown and only the narrow fringe around the fiords had been accurately mapped.

In its history of settlement prior to 1871 the region was distinctive. Once the haven of Captain James Cook and other early navigators, the sounds on the western seaboard of the region came to shelter settlements and to furnish refitting areas for sealers and whalers. Though certain parts of the region, notably the Milford Sound area, had been frequented by the Maoris on account of the presence of greenstone, the native population was always very small and essentially migratory in character. In the south the coasts of Foveaux Strait and Stewart Island had contained in the 1830's important shore-whaling stations, but since the advent of organised settlement had become almost uninhabited.

It is necessary to note, however, that a small settlement had been placed at Martin's Bay in the far north of the region. It did not long survive and in 1871 was suffering from lack of food, difficulties of transport and communication, and dearth of suitable land for farming. In the south two Maori settlements were to be found on Ruapuke Island and Stewart Island, and a small population of whalers and farmers existed on the latter with their main village at the Neck in Patterson Inlet.

AN INHOSPITABLE LAND

Though attempts at prospecting for gold had been made, no sizeable deposits were found save for a minor field in the Orepuki area. The timber resources of the area also remained unexploited except on the eastern boundary and at the mouth of the Waiau River in the south. Although in its southern sector the eastern boundary of this unexploited region was receding slowly towards the west, difficulties in clearing the land and the nature of the surface configuration were deterrent to either pastoral or agricultural utilisation of the land. In itself the region formed a barrier between the sheltered havens of its western edge and the productive country to the east which was forced to rely upon the uncertain and even dangerous harbours of the east coast as its outlet.

Thus in the Otago of 1871 this western region was almost unknown and disregarded. While resources of land, gold and timber remained available in the easier and more accessible east, the cold, wet, steep and densely-forested west remained the haunt of strange birds and mythical Maori tribes.

Interior Otago

Interior Otago possessed a very ill-defined boundary with the rest of the province to the south and east. Broadly speaking its limits coincided fairly closely with the line dividing the hundreds from the run country and could be correlated also with climatic, vegetation and population boundaries.

The region did not exhibit any great degree of unity of terrain except that the major part of it consisted of a series of ranges and basins. The vegetation was chiefly tussock grassland with scrub in the gullies and beech forest at higher altitudes, in particular along its western boundary — all these reflecting a climate characterised by extremely dry conditions and a generally variable rainfall with high seasonal and diurnal temperature ranges and the characteristic foehn-type northwest wind. In contrast to Fiordland it did not extend to the sea but was intersected by several large rivers, notably the Clutha and the Taieri which served as avenues of transport for limited areas.

The geographic character of interior Otago may be summed up in two words, 'gold' and 'wool'. In this region were nearly all the gold deposits in Otago. It will be remembered that the exploitation of gold gave rise to a characteristic alteration of the physical landscape and to a distinctive distribution of population and type of settlement. In contrast to the west this was a region of exploitation—water races in the hillsides, mounds of sand and gravel tailings in the valleys, and the rapid vanishing of the forest patches in the quest for timber.

Though the density of population of the area as a whole was not great, the strongly-marked localisation in certain limited areas was a differentiating factor in the region. The type of settlement—the prospector's hut and the goldfields town already described—was to be found nowhere else in the province. This was a region also where the dominant and almost the only form of farming was that of extensive pastoralism based on the raising of sheep for wool. Though small areas of arable farming were to be found especially near the larger settlements, and though on the eastern and southern boundaries the freehold agricultural farms were steadily encroaching on the pastoral runs, the region as a whole was divided up into a number of large tracts of land held under depasturing licences. The sheep grazed on the natural tussock grassland which, although in some areas periodically burnt, had not undergone the depletion of a later period. The isolated homesteads of the runholder, and the lack of fences and roads were distinguishing features of this region.

It was a region which at first glance appeared almost uninhabited and which, over large areas, showed no sign of human habitation. Where human settlement was found, however, the alteration of the landscape was so violent and extensive that the contrast was even greater. Thus it was an area which was both exploited and unchanged, an area of high ranges and deep sheltered basins, of hot dry summers and cold snowy winters, of rich tussock grassland and small patches of beech forest, of gold and of sheep.

EASTERN OTAGO AND SOUTHLAND

The third geographic region occupied the remainder of the Province of Otago, about one fifth of its area. From the north it narrowed in a strip along the coast, gradually broadening south of Dunedin to include the major part of the Southland Plain. Its sea coast was very different in character from that of the western region, for only in two localities, in Otago and Bluff Harbours, did natural sheltered harbours exist. Elsewhere the coast was characterised by long stretches of gently shelving sandy beach with a few rocky headlands and river mouths where the depth of water was, however, sufficient only for small vessels.

The landforms of the area were for the most part plains or rolling downland, ranging from the intricately-dissected Catlins to the flat swampy plains of southern Southland. A well-watered region, it contained numerous small streams as well as the lower reaches of the larger rivers. The area showed a considerable variation of climate but was in general wetter than the interior and warmer than the west. There were tussock grassland in the north, small stands of coastal podocarps near Dunedin, scrub in the seaward gullies, patches of beech at higher altitudes, and some quite extensive mixed forests in Southland and South Otago as well as large areas of swamp vegetation.

Except for Dunedin's urban population, the people of the area were much more evenly distributed than in the interior. The region was characterised by a number of small coastal ports and inland agricultural towns and villages rather different in appearance from the goldfields settlements. Within these towns were located the majority of grain mills and other industrial concerns of the province. The region possessed Otago's only railways in the year 1871 and also a more extensive road system than was found in the interior. Although some small gold deposits had been found the region did not show to any great extent the signs of mineral exploitation so typical of the interior.

In farming the eastern Otago and Southland region was clearly distinguished from the rest of the province in that it contained some few areas of arable cropping. The land tenure system was such that the district was divided into small blocks with a large number of fences, hedges and shelterbelts. Houses were smaller than the homesteads of the interior and more closely spaced. This was the food-growing region of the province, an area of slower and less spectacular development with a quieter and more mature cultural landscape. It was a region where the modification of the physical landscape was less profound than in the interior, but was more widespread.

Thus the Province of Otago in 1871 provided examples of three major kinds of land: uninhabited, exploited and cultivated. It must be emphasised, however, that the regions into which it has been divided embrace in detail a much wider variety of geographic conditions, so much so that the Otago of 1871 contained perhaps greater geographic contrasts within its small area than at any other period of its history.

TROPICAL CYCLONES IN THE SOUTHWEST PACIFIC

J. W. HUTCHINGS

IT HAS been known for many years that the tropical parts of the southwest Pacific, in common with many other tropical areas, are subject to the occurrence of violent, rotating windstorms, known locally as 'hurricanes', but more generally termed 'tropical cyclones'. The occurrence of such storms is not without a certain economic importance, since the winds, rain and stormwaves associated with these disturbances are often responsible for great destruction, especially in the low-lying areas of land. In the southwest Pacific tropical cyclones are often accompanied by loss of life and property, destruction of food and other natural resources, as well as by a dislocation of the economic life of Pacific communities.

Storms of a similar nature occur frequently in the tropical north Atlantic and, owing to the economic importance of their destructive effects in the southern United States, the storms there have been thoroughly studied. During the second World War military necessity also contributed greatly to knowledge of the tropical disturbances in the north Pacific, but the new techniques introduced there, such as aircraft reconnaissance and radar precipitation studies, have not been employed in the southwest Pacific area.

EARLIER STUDIES

Despite the importance of tropical cyclones to the inhabitants of the southwest Pacific, little has been done to study their occurrence and characteristics. The pioneer work was that of Visher[1] which included information from the tropical area south of the equator between 160 degrees east and 140 degrees west. Visher collected information on the frequency of occurrence of strong windstorms in the various island groups and, by a combination of such statistics, attempted to deduce the frequency of occurrence of tropical cyclones in the southwest Pacific. It should be noted that at this time the available weather information was not sufficient to permit the construction of adequate synoptic weather charts. Taking this into account, it appears likely that the accuracy of the statistics given by Visher may be affected, though perhaps not seriously, by a number of factors. First, one and the same tropical cyclone will normally pass through more than one group of islands and, consequently, a combination of the statistics for separate groups of islands is liable to overestimate the number of tropical cyclones actually occurring. Visher attempted to make allowance for this factor. Second, when considering the probable origins or places of first record of tropical cyclones in this area it is probable that disturbances originating north of ten degrees south, where there are few islands, would be counted as originating in higher latitudes where the island groups are more numerous. Third, only very schematic reconstructions of the tracks followed by tropical disturbances could be obtained without adequate synoptic charts. And, finally, since some of the cyclones would occur entirely over the sea, their detection would be difficult without adequate reports from ships and aircraft.

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[1] S. S. Visher: 'Tropical Cyclones in Australia and the South Pacific and Indian Oceans', *Monthly Weather Rev.*, Vol. 50, No. 6, 1922, pp. 288-295; *idem:* 'Tropical Cyclones of the Pacific', *Bernice P. Bishop Museum Bulletin No. 20,* Honolulu, 1925; and *idem:* 'Australian Hurricanes and Related Storms', *Commonwealth of Australia Bureau of Meteorology Bulletin No. 16,* Melbourne, 1925.

From about 1940 on, however, the weather services in the southwest Pacific were greatly expanded and in some areas military operations resulted in the establishment of a very dense network of weather stations as well as in the receipt of numerous weather reports from aircraft. The material now available allows some new conclusions to be drawn about the tropical cyclones of this area and permits the tracks of these disturbances to be plotted with sufficient accuracy. It therefore seemed appropriate to make a further study of the characteristics and distribution of tropical cyclones in the southwest Pacific using material from the period for which adequate synoptic charts are available. The results reported here are based on data for the twelve years 1940–1951.

A General Survey

Throughout the tropics day-to-day variations in the broad-scale weather patterns are normally comparatively small. Wind distribution, for example, on any particular day normally bears a strong resemblance to the appropriate seasonal mean. Nevertheless, from time to time, local but well-marked departures from the mean wind pattern occur. These are usually connected with cyclonically-rotating wind systems of a vortex nature. Any such cyclonically-rotating wind system may be called a *tropical disturbance*. Such disturbances are usually associated with a definite centre of relatively low barometric pressure about which the winds circulate in a cyclonic fashion. A careful study of such tropical disturbances in this region makes it probable that there exists a continuous spectrum of tropical disturbances whose maximum intensities vary continuously from barely detectable disturbances with winds of from five to ten knots, to the most intense tropical cyclones with winds exceeding 100 knots.

Cyclones and Depressions

From a theoretical point of view it would be important to study the entire spectral range of these disturbances, but from a practical point of view the disturbances carrying higher energy and characterised by high windspeeds and great destructiveness have a special importance. It is thus found useful to have an arbitrary classification of tropical disturbances based on the maximum windspeed developed near the ground by the disturbance. It is found that those tropical disturbances in which the actual windspeed reaches the equivalent of a Beaufort Scale number of 9 or more[2] are generally characterised by more or less destructive effects and such disturbances are here termed *tropical cyclones.* Those lesser disturbances in which the maximum wind speed does not exceed the equivalent of a Beaufort Scale number of 8 are not generally accompanied by much significant damage and are here termed *tropical depressions.*[3]

Another serious difficulty in the study of the tropical disturbances of this region—apart from that of definition—is the density of reporting stations necessary to reveal the maximum windspeed associated with any particular disturbance. From the autographic records of stations which have experienced the direct passage of the centre of a tropical cyclone it is known that the diameter of the circle of maximum winds may certainly be only of the order of from 100 to 200 miles or even less. It thus appears probable that many actual tropical cyclones in the southwest Pacific area would never be recorded as such by the rather widely spaced network of island observation stations.[4]

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[2] Over the years there have been some minor amendments to the values of windspeed taken to correspond to the various numbers on the Beaufort Scale. The latest authoritative table of equivalents is given in Table I, but here it will be sufficient to consider the approximate values (in knots) given in the last column of the table as giving the speed-equivalent of the wind one ordinarily observes near the surface of the earth. It should be noted that before 1 January 1949 all the basic wind information on the synoptic charts was observed and transmitted as a Beaufort Scale number. As from 1 January 1949 the synoptic wind reports represent the windspeed in knots at a height of approximately ten metres above the ground, but even in these cases the great majority of the reports originated from wind forces observed in Beaufort Scale numbers. It has therefore been thought advisable to use the Beaufort Scale numbers as much as possible in this study.

[3] A similar classification has also been proposed elsewhere. (See M. A. Garbell: *Tropical and Equatorial Meteorology,* New York, 1947.) In these classifications the windspeed considered refers to the mean speed and not to the speed attained in gusts which may of course be considerably higher.

DATA AVAILABLE

The basic data used in this study were provided by the tropical parts of the original six-hourly surface synoptic weather charts drawn in the offices of the New Zealand Meteorological Service. The area covered by this study and the available observational network are shown in Figure 1, but it should be remembered that in addition to the land stations appearing on the chart there are often numerous plotted reports from ships at sea and some reports from aircraft. The main part of this network has been characterised by a steady improvement in the quantity and quality of available synoptic data during the period 1940-1951, but those from the Solomon Islands, New Hebrides and New Caledonia have in this period been inadequate. Early in the period the Gilbert and Ellice groups also furnished inadequate information, but this data steadily improved and became quite adequate for most of the period. Some idea of the variations in the network is provided by Figure 1, in which circles denote stations operating in 1945 and crosses denote stations operating in 1951.

It seems, then, that although a few tropical cyclones might have been missed on account of the inadequate data available from some areas, on the whole the data available are sufficient to bring out clearly enough the main characteristics of the tropical cyclones of this area. The data do not allow of any firm conclusions about the method of formation of tropical cyclones but it is possible to describe their formation in general and to suggest the possibility that their formation takes place in at least two different ways.

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[4] Nevertheless, if the information is to have an objective basis, any study of the windspeeds attained in the tropical cyclones of this area must be based on the winds actually recorded at stations in the observational network. In this study, therefore, the various tropical cyclones occurring during the period have been classified according to the Beaufort Scale numbers of the maximum windspeeds observed in the network at the main six-hourly reporting times of observation. Since, according to definition, the maximum windspeed in a tropical cyclone must reach a Beaufort Scale number of 9 or more, these disturbances have here been classified according to the scale numbers 9, 10, 11 and so on. It may be noted that Visher effectively employed the same kind of approach in that he adopted reports of 'gale' winds as indicating the existence of a tropical cyclone. It seems, therefore, that the statistics for the frequency of occurrence of tropical cyclones given by Visher would (apart from the minor defect mentioned above) be reasonably comparable with the present ones. They may however include a somewhat larger part of the intensity spectrum of the tropical disturbances found in this region. The statistics below which refer to regions of origin of tropical storms relate to the places of origin of such disturbances as later develop into tropical cyclones. These statistics are thus not directly comparable with those of Visher which relate to the approximate origin or first report of a disturbance as an already existing tropical cyclone. In any case it must be clearly recognised that the frequency statistics given in this paper, or in that of Visher, simply relate to those determinable from the observational network existing during the period and that it cannot be determined how these statistics are related to the corresponding parameters pertaining to the tropical disturbances actually existing in the atmosphere. They are, then, strictly 'sample' statistics and samples obtained, moreover, by a sampling technique that is not too adequate in space and time.

General Character of Tropical Disturbances

Reference to average climatic charts shows that the average surface wind pattern observed in the tropical southwest Pacific varies rather markedly with the season of the year. During the winter months the whole area is covered by a broad and rather uniform current of air flowing from between the east and southeast. These winds, the so-called southeast trade winds, also appear with great regularity on the daily charts and appear to dominate the tropical circulation in this area at this time of the year.

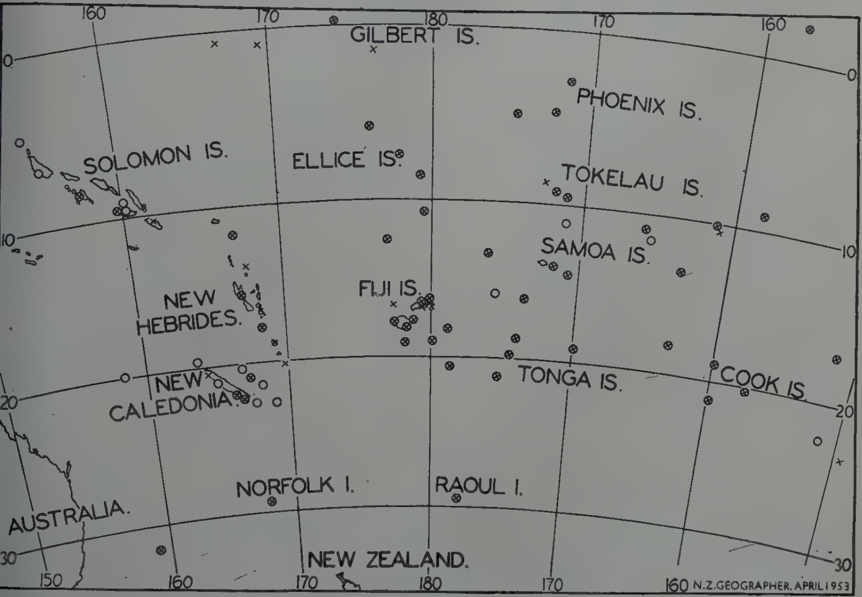

Fig. 1. Observational network in the southwest Pacific.

As spring advances, features of the summer circulation begin to appear with increasing frequency on the daily charts. This circulation is characterised by the appearance of winds from the northeast, north, northwest, or even west, in the most northerly parts of the area. These winds are commonly regarded as the northeast trades of the northern hemisphere which have supposedly crossed the equator and in some cases have been deflected into winds with a component from the west. The more or less diffuse boundary between these two sets of winds forms the so-called intertropical convergence zone and, when present, is generally noticeable also in the pressure field as a shallow trough of low pressure, with or without one or more weak cyclonic circulations. Under normal or undisturbed summer conditions these circulations remain weak and no other cyclonic circulations are observable. However, although the undisturbed winter and summer patterns appear very frequently, they are not absolutely invariable; from time to time, both in winter and in summer, more marked cyclonic disturbances can be observed.

These cyclonic disturbances tend to form in two distinct and characteristic ways, the first being connected with the intertropical convergence zone and the second being connected, especially during the winter months, with a wave-like deformation of the normal undisturbed easterly flow. In order to gain a clearer view of these two processes it is of interest to illustrate them synoptically by reference to the analysed synoptic charts of typical cases.

As an example of that type of cyclogenesis which is connected with the intertropical convergence zone, reference should be made to *Fig.* 2 (a, b, c, d)[5] which show the development of the weather situation from 0001 hours GMT on 14 March 1944 to 0001 hours GMT on 19 March 1944. The analysis is presented by means of streamlines which attempt to depict the distribution of wind direction observed just above the

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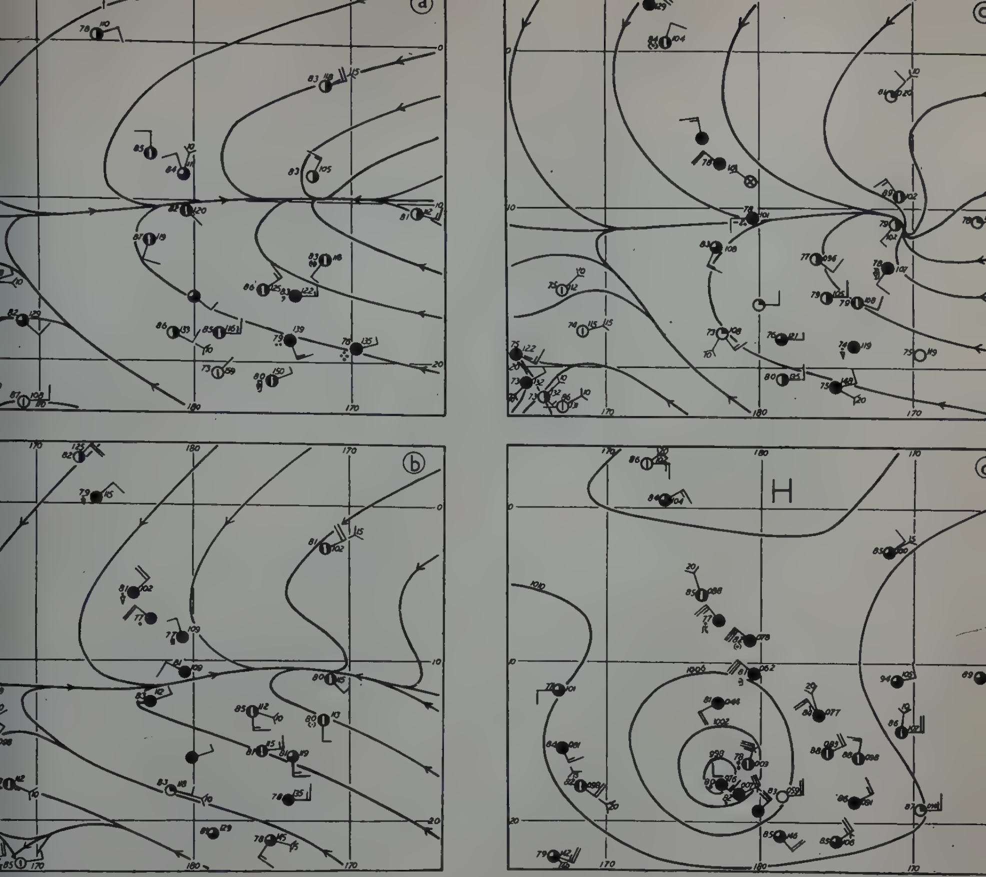
[5] In examining the charts in *Figs*. 2 and 3 it should be remembered that the fundamental concepts and analytical methods of tropical meteorology have never been firmly established and that even the basic terms used above—for example 'deflection of the northeast trade winds' and 'intertropical convergence zone'—are questionable and may in the future have to be greatly modified. (See C. E. Palmer: 'Tropical Meteorology', in *Compendium of Meteorology,* Boston, Mass., 1950, pp. 859-886.) These concepts are used here simply in a descriptive fashion in a mainly descriptive statement and in a sense in which they will be readily understood by tropical meteorologists.

The plotting model used for the observations on these charts is formed by selecting elements from the standard international model. The point of observation is represented by a circle which is blacked in according to the total amount (eighths of sky covered) of cloud present, while the weather at the time of observation is indicated by symbols to the left of the station circle. Dots denote rain, commas denote drizzle, small triangles denote showery precipitation: all these may be specially grouped to denote intensity and continuity of the precipitation in question.

The direction of the surface wind is indicated by an arrow flying with the wind while the windspeed is indicated by the number of barbs on the arrow, one full barb denoting ten knots and a half-barb denoting five knots. Air temperature is plotted (in degrees Fahrenheit) to the left of the circle just above the symbol for the present weather while the barometric pressure (corrected to mean sea level) is plotted in a similar position to the right of the circle. The barometric pressure is expressed in millibars and tenths but the decimal point and the initial 9 or 10 are omitted in plotting. Thus 1013.5 mb. is plotted as 135 while 997.2 mb. appears as 972 on the charts.

Where available, the windspeed and direction at 2000 feet is also plotted on the charts by an arrow bearing the appropriate speed in knots. Notwithstanding the date to which the charts refer the plotting has been made to conform to the most recent recommendations of the World Meteorological Organisation. Where necessary, wind data have been converted from Beaufort Scale numbers to equivalent windspeeds in knots by use of the third column of Table I.



N.Z. GEOGRAPHER, APRIL 1

Fig 2. (a, b, c) Streamline analysis on 14 March 1944 at 0001, 0600 and 1800 hours GMT; (d) isobaric analysis at 0001 hours GMT on 19 March 1944.

layer of surface friction. No attempt has been made to draw isotachs (lines of equal windspeed) with the very limited amount of data available. In this analysis most weight is given to actual reports of wind at 2000 feet obtained by means of pilot balloons but where this information is not available much use has been made of the surface wind reports. By making proper allowance for surface friction and by avoiding the use of reports from stations known to be locally influenced it is generally possible to bring out the main characteristics of the wind-field with sufficient accuracy.

In *Fig.* 2a the most important feature of the situation is the well-marked line of convergence extending from east to west between latitudes ten and eleven degrees south. There appears to be a zone of convergence between air from the southern hemisphere (the southeast trades) and northern-hemisphere air which has crossed the equator as a northeast flow and then gradually turned into a flow from the north and northwest (the deflected northeast trades). This pattern has, however, been established only recently, and it seems likely that, although northern-hemisphere air may exist in the northern part of the area, the convergence line is more properly considered as one formed in a fairly homogeneous mass of air. Nevertheless, this convergence line would be traditionally described as the intertropical convergence zone. A singular point of convergence appears on this line just south of the Tokelau Islands. The main interest of this study lies in the convergence line and its associated singular point of convergence. (The rather complex and extremely weak system of convergence and divergence in the extreme southwestern part of the area need not be considered.)

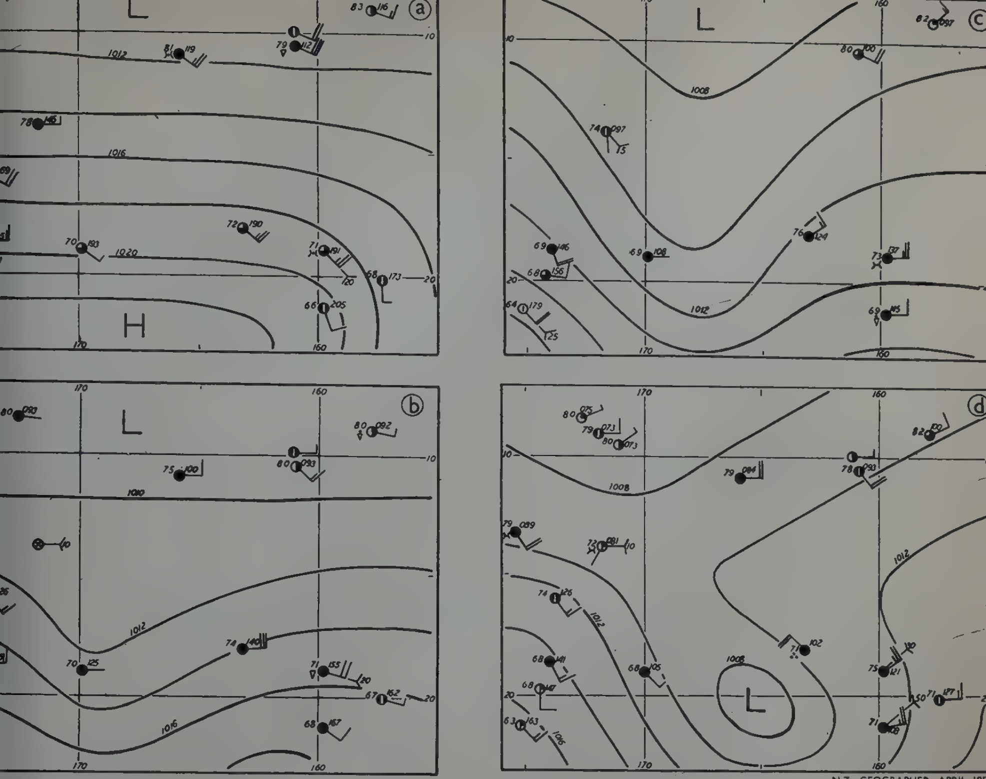
TABLE I

WINDSPEEDS CORRESPONDING TO GIVEN BEAUFORT NUMBERS

Beaufort Number	Range of Mean Windspeed at Height of Ten Metres		Approximate Equivalent (Knots)
	M.P.H.	Knots	
7	32 - 38	28 - 33	30
8	39 - 46	34 - 40	35
9	47 - 54	41 - 47	45
10	55 - 63	48 - 55	50
11	64 - 72	56 - 63	60
12	73 - 82	64 - 71	70
13	83 - 92	72 - 80	75
14	93 - 103	81 - 89	85
15	104 - 114	90 - 99	95
16	115 - 125	100 - 108	105
17	126 - 136	109 - 118	115

Figs. 2b and 2c show the gradual development of the centre of convergence and its slow movement toward the south. Up to this point the disturbance has hardly been perceptible in the pressure field, as may be seen from the plotted reports, but from now on a definite centre of low pressure can be observed. *Fig.* 2d shows an isobaric analysis of the situation at 0001 hours GMT on 19 March. It will be seen that a strong vortex circulation has developed in which, later, winds attain a reported velocity of Beaufort Scale number 9.

The other type of cyclogenesis, that connected with a wave-like deformation of a general zonal current from the east, is illustrated in Figure 3. *Fig.* 3a represents an isobaric analysis of the weather situa-



N.Z. GEOGRAPHER, APRIL 195

Fig. 3. Isobaric analyses: (a) at 0600 hours GMT on 15 July 1951; (b, c, d) at 0600, 1200 and 1800 hours GMT on 17 July 1951.

tion at 0600 hours GMT on 15 July 1951, and shows that, at lower levels, above the friction layer, there exists a broad general current of air from the east. Although there is little information at higher levels the general temperature distribution makes it probable that this current is relatively shallow and that it becomes a westerly air flow before an altitude of 10,000 feet is reached. The current is thus characterised by a fairly high value of positive shear with height. During the next day a very slight wave-like deformation of the pressure field occurs between 165 and 170 degrees west. This deformation gradually increases in amplitude until by 0600 hours GMT on 17 July a fairly rapid development along longitude 170 degrees west is in progress (*Fig.* 3b). This is still more evident at 1200 hours GMT (*Fig.* 3c), and by 1800 hours GMT (*Fig.* 3d) a closed centre of low pressure has formed which later deepens into an extensive and intense vortex. In this case there are no ship observations to indicate whether the intensity of this vortex reached a Beaufort Scale number of 9, but the process appears to be fairly common and there is little doubt that very intense vortices can develop in this manner. The severe tropical cyclones of August and September 1950 developed in just this manner but unfortunately the observations available during the early stages of cyclogenesis were inadequate to bring out the process as clearly as in the case treated above.

This type of cyclogenesis might seem analogous to the 'easterly wave' type described by Dunn[6] but there are essential differences in that the easterly wave occurs in areas of deep easterly currents while in the cases considered here it is clear that, in most cases at least, the easterly currents are relatively shallow and change to westerly by the time a height of 10,000 feet is reached. The process has also been considered as a case of frontal waves along a frontal surface lying almost stationary in low latitudes, but the presence of a sharp front has never been demonstrated in a satisfactory manner. The cyclogenesis is probably more clearly described as a case of instability in a zonal current with a fairly high positive value of shear and a low mean value for the zonal westerly speed. This kind of instability of the upper long wave pattern has recently been emphasised by Berson[7] in connection with the weather phenomena of high and middle latitudes. The present investigations would suggest that this kind of instability is of fairly frequent occurrence in the low-altitude parts of the southwest Pacific in winter and this circumstance brings out the importance of the magnitude of the absolute circulation, as is pointed out by Berson.

There are, then, two essentially different ways in which the tropical disturbances of this region may originate, but in the statistics in Table II it has not been thought necessary to distinguish the two modes of formation.

FREQUENCY OF TROPICAL CYCLONES

The data in the accompanying tables refer to those tropical disturbances in which a windspeed of at least Beaufort force 9 was actually reported at some station or ship in the observational area between the equator and thirty degrees south and between longitudes 150 degrees east and west. The period covered is from 1940-1951 inclusive. In Table II the first figure of each reference is the identification number of the cyclone, while the second figure refers to the date of the synoptic chart on which the tropical disturbance was first definitely located as a cyclonic circulation distinct from the general wind distribution prevailing at that time. The third figure refers to the maximum recorded intensity attained by the disturbance in question and is indicated by the appropriate number on the Beaufort Scale. There are three cyclones which, although their paths lay partly within the area being considered, actually originated outside it. In these cases the second figure in Table II refers to the first synoptic chart on which could be plotted the position of the disturbance in the area under discussion. These are marked with an asterisk in the table.

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[6] G. E. Dunn: 'Tropical Cyclones', in *Compendium of Meteorology, op. cit.*, pp. 887-901.

[7] F. A. Berson: 'Summary of a Theoretical Investigation into the Factors controlling the Instability of Long Waves in Zonal Currents', *Tellus*, Vol. 1, No. 4, 1949, pp. 44-52.

TABLE II

FREQUENCY AND MAXIMUM INTENSITY OF TROPICAL CYCLONES, 1940–1951, LATITUDES 0–30°S, LONGITUDES 150°E–150°W

ear	January	February	March	August	September	December	Annual Totals
940		27 : 4 : 9	32 : 31 : 9*				3
		26 : 14 : 10					
941	16 : 13 : 9	24 : 1 : 12					4
		29 : 16 : 16					
		28 : 26 : 9					
942		31 : 16 : 9				2 : 27 : 9	3
		25 : 25 : 9					
943	7 : 5 : 9*		38 : 4 : 9				3
			40 : 16 : 9				
944	8 : 16 : 12		41 : 15 : 9				3
	14 : 27 : 12						
945							0
946	17 : 10 : 9	23 : 24 : 11	37 : 17 : 9			6 : 24 : 11	5
	9 : 13 : 9						
947	12 : 11 : 9	22 : 21 : 10	35 : 9 : 9				4
	10 : 17 : 9						
948	13 : 21 : 9		36 : 11 : 11			3 : 5 : 12	5
	15 : 31 : 9		34 : 19 : 9				
949	11 : 17 : 12	19 : 8 : 11				1 : 9 : 12	5
		18 : 27 : 12				5 : 17 : 11	
950		30 : 21 : 9	39 : 28 : 9	43 : 19 : 10	42 : 12 : 11		5
		20 : 24 : 9					
951		21 : 20 : 12	33 : 13 : 9*			4 : 21 : 12	3
thly s	11	14	10	1	1	6	
thly uency	0.9	1.2	0.8	0.1	0.1	0.5	

Total number of cyclones: 43. (No cyclones occurred in April, May, June, July, October or November.) Average monthly frequency: 3.6. *Originated outside area.

There is a well-marked concentration of tropical cyclones in the period from December to March inclusive. February appears to be the month of maximum frequency although this small excess of frequency over those of January and March may not be significant. Tropical cyclones are extremely rare in the other months of the year. Moreover, as previously illustrated, it seems likely that these so-called winter tropical cyclones are formed in a manner which is quite distinct from the typical mode of formation of the December-March cyclones of this region. Table II also shows that there is a considerable variation in the number of tropical cyclones observed in any one year. For this period and this area the number varied from none to five.

Frequency of All Disturbances

If all tropical cyclones are considered regardless of intensity, it can be seen from Table II that during the twelve years covered by the statistics there occurred forty-three tropical cyclones whose tracks lay wholly or partly within the area considered. Of these, however, only forty originated in this area. The total number of cyclones gives an average annual frequency of 3.6 tropical cyclones for this southwest Pacific area.

Visher provided information on the frequency of tropical cyclones in nearly the same area, but the numbers recorded prior to 1870 seem rather small when compared with records for later years. There appear to be some discrepancies in Visher's figures, but taking the most recent publication[8] for the years 1874-1924 inclusive (1894 missing) there was an annual frequency of 3.7. The agreement between this figure and that in Table II is probably fortuitous because Visher included all reports of gale-force winds, and these probably included a proportion of winds which would be more properly described as Beaufort force 8. Nevertheless it shows that the order of magnitude of the result is probably correct. By a rather subjective consideration of the number of tropical cyclones passing entirely between the island groups and thus not included in his tabulations, Visher arrived at twelve as the probable frequency of tropical cyclones in this area, but it now appears that this figure would be a considerable overestimate.

It is difficult to compare such figures with corresponding frequencies for other regions since different authors have employed rather different criteria for the inclusion of a disturbance as a tropical cyclone. From the statistics available, however, it may be concluded that the disturbances here considered as tropical cyclones occur rather less frequently than those in a comparable longitudinal belt of the tropical north Atlantic and considerably less frequently than those in a comparable area of the tropical north Pacific. On the whole, then, the tropical south Pacific region is not, contrary to what has often been supposed, a region of very frequently occurring tropical cyclones.

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[8] Visher: 'Australian Hurricanes and Related Storms', *op. cit.*, Table 13.

Table III shows an analysis of the frequency of tropical cyclones which equal or surpass definite intensities on the Beaufort Scale. The sharp decrease in frequency beyond Beaufort force 12 is certainly due to the difficulty of making any attempt to estimate the scale number for extremely strong winds. It is significant that the only case of force 16 recorded is a conversion from a wind speed as measured by a pressure tube anemometer. If, however, 0.1 is accepted as the annual frequency at force 16 a rough idea of a possible intensity distribution can be obtained by interpolation on a graph.

TABLE III

NUMBER AND ANNUAL FREQUENCY OF TROPICAL CYCLONES EQUALLING OR SURPASSING A GIVEN BEAUFORT NUMBER

Beaufort Number	Jan.	Feb.	Mar.	Aug.	Sept.	Dec.	Total	Annual* Frequency
9	11	14	10	1	1	6	43	3.6
10	3	8	1	1	1	5	19	1.6
11	3	6	1		1	5	16	1.3
12	3	4				3	10	0.8
13		1					1	0.1
14		1					1	0.1
15		1					1	0.1
16		1					1	0.1

*Expressed as a percentage.

REGIONS OF ORIGIN

In the case of forty tropical cyclones examined the place of origin of the disturbance could be determined with reasonable accuracy. In Figure 4 the number of cyclones originating in each five-degree square is plotted at the centre of the appropriate square. Where no cyclones originated in a particular square it has been left blank. It should again be emphasised that, as used here, the term 'origin' refers to the first appearance on the synoptic chart of a disturbance which later develops into a tropical cyclone. The data in Figure 4 cannot, therefore, be interpreted as the frequency of occurrence of actual tropical cyclones over the area under consideration.

It will be seen that a broad band of maximum frequency extends from the Ellice Islands southwestwards through the area between the Santa Cruz Islands and the northern New Hebrides and thence westwards towards the northern coast of Queensland. It might be expected that this band would be related to the relatively narrow belt between the extreme northern and southern mean positions of the intertropical convergence zone during the December-March period. This indeed proves to be the case. Mean monthly positions of the intertropical convergence zone can be roughly deduced from mean monthly charts of surface winds such as are contained in the Monthly Meteorological Charts of the Western Pacific Ocean.[9] The mean positions for December and February (the month of extreme southerly position) as shown by the data in this publication are plotted in Figure 4 and it will be seen that the band between these two positions corresponds very well with the band of maximum frequency of tropical cyclones as deduced

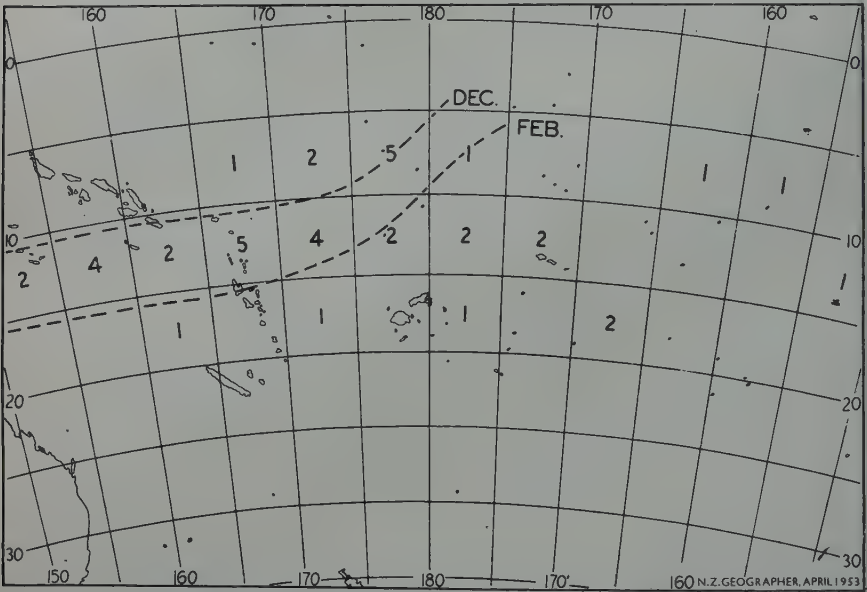

Fig. 4. Number of tropical cyclones originating as tropical disturbances in each five-degree square, 1940–1951.

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[9] See *Met. Office Marine 422* published by the Air Ministry in London.

in this study. The number of tropical cyclones considered here is too small for much statistical significance to be placed on this result, but it seems likely that most of the tropical cyclones in the December to March period actually have their origin at or near the intertropical convergence zone as is asserted by traditional theory.

Consideration of the number of tropical cyclones originating in the various five-degree latitudinal zones between the equator and thirty degrees south reveals the distribution given in the second column of Table IV. The third column of the table shows the distribution obtained by combining the figures given by Visher for the months December-March inclusive, but not including those disturbances for which the information is said to be fragmentary. The fourth column sets out this distribution proportionally reduced so that the total number of cyclones is forty. The second and fourth columns are then, as far as the number of observations are concerned, directly comparable.

TABLE IV

FREQUENCY OF ORIGIN OF TROPICAL DISTURBANCES IN FIVE-DEGREE LATITUDE ZONES

Latitude Zone (degrees south)	Present Investigation	Visher's Estimate	Visher Reduced
0 - 5	—	—	
5 - 10	11	2	0.6
10 - 15	24	27	8
15 - 20	5	82	26
20 - 25	—	16	5
25 - 30	—	1	0.3
Total	40	128	40

The distributions in the second and fourth columns are in reasonable accord except for the fact that the centre of the first distribution is shifted to the 10–15 degree latitude zone instead of being found in the 15-20 degree zone as Visher's data suggest. This fact is quite in accordance with what might be expected in view of the fact that the present figures relate to the areas of origin of disturbances which *later* develop into tropical cyclones, while Visher's statistics refer to actually existing tropical cyclones. The five degrees of latitude which separate the centres of the two distributions may be interpreted as indicating that, on the average, a disturbance traverses a meridional distance of roughly five degrees before attaining tropical cyclone intensity.

In Figures 5, 6, 7, 8 and 9 are shown the paths followed by the forty tropical cyclones originating in the area together with the paths followed by the three other disturbances which originated outside but whose tracks lay partly within the area. The paths are grouped according to the months of origin of the cyclones in question. The GMT positions in 00 hours have been marked on the charts, together with the identification number for each cyclone. The actual dates of each position can be ascertained from Table II. In general no attempt has been made to follow disturbances beyond the confines of the area under consideration and it has also not been found practicable to indicate on the track just those portions of the path of a given disturbance where it became a tropical cyclone or where destructive winds occurred. The figures simply show the tracks followed by the tropical disturbances in question from their earliest detection to the positions where they either dissipated or moved out of the area. This is not to say that the disturbances were actually tropical cyclones along all their plotted paths or that destructive effects occurred along the entire track. Very often the indications seem to suggest that a given tropical disturbance becomes an intense tropical cyclone only over a relatively short portion of its path while in other cases the intensity remains high

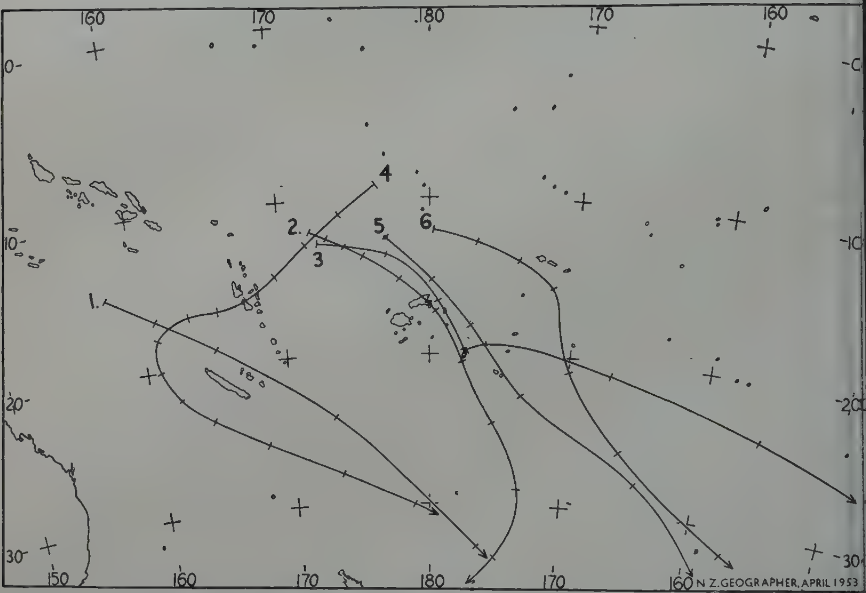


Fig. 5. Tracks of tropical disturbances which developed into tropical cyclones—December.

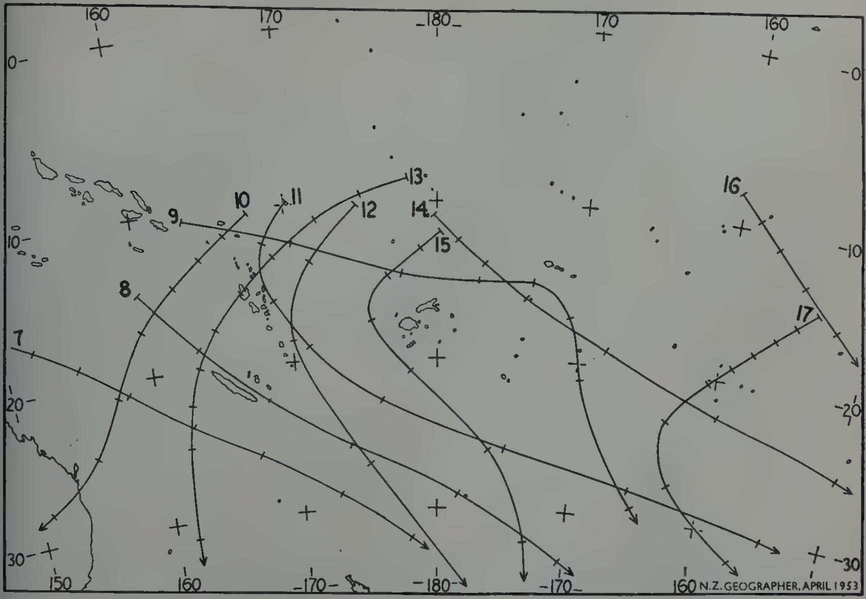
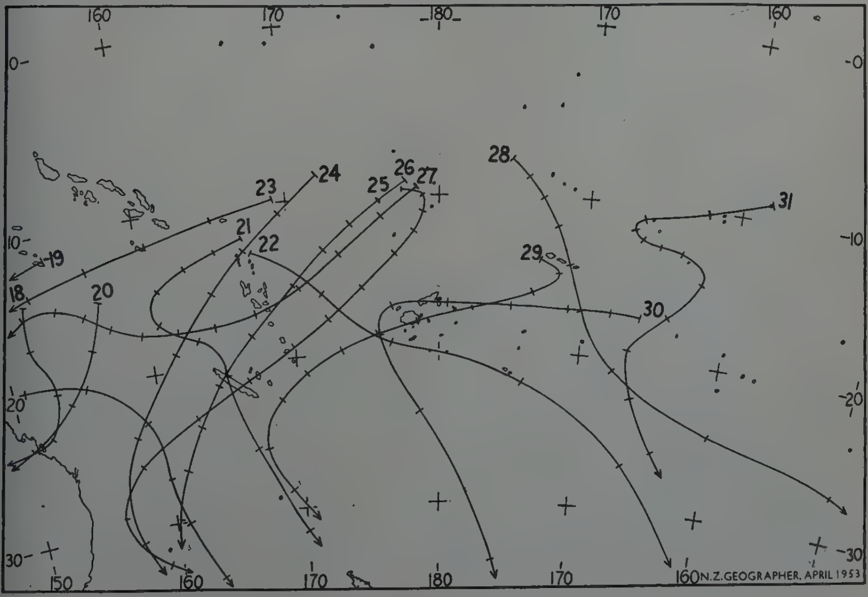


Fig. 6. Tracks of tropical disturbances which developed into tropical cyclones—January.

over the greater portion of the track. Unfortunately the data available in the southwest Pacific area do not allow of any very certain conclusions on these questions and synoptic studies of individual tropical disturbances are possible only in a few cases and over rather limited portions of their tracks.

Fig. 7. Tracks of tropical disturbances which developed into tropical cyclones—February.



If one compares the general character of the motion of tropical cyclones in the southwest Pacific as exhibited in the plotted paths with that of tropical cyclones of other regions, a well-marked and characteristic difference appears. In most areas where tropical cyclones are frequent, by far the greater number of cyclones move initially towards the west, and only later in their life history (after recurvature) do they take a course towards the east. In the southwest Pacific, however, tropical cyclones very frequently move initially towards the east and in most cases continue this motion until they leave the area of the chart. In this respect it is interesting to compare the behaviour of the tropical cyclones of the southwest Pacific with those of the tropical north Atlantic. Tannehill's examination[10] of the data covering the years 1901-1937 for the tropical north Atlantic discloses that only ten percent of the tropical cyclones considered moved initially towards the east while a further five percent moved initially toward the north. Thus eighty-five percent possessed an initial westward motion. Of the forty-three tropical cyclones considered here forty-four percent moved initially towards the east and fifty-six percent had an initial westward motion. Thus in the southwest Pacific the frequencies of eastward and westward moving tropical cyclones are much more nearly equal than appears to be the case in the tropical north Atlantic. The relevant data for the southwest Pacific is given in Table V. It should be noted that two cases in February with very small initial eastward motion have been considered as moving in a typical westward path, but if these are included as cases of initial eastward motion the eastward and westward moving cyclones become even more equally distributed.

Although the number of cases considered is not large enough for statistical treatment, Table V also brings out the strong variation in the characteristics of the motion of the cyclones as the season advances from December through January, February and March. Thus in December most cyclones are characterised by initial eastward motion but in January this characteristic has been lost and initial westward motion is slightly predominant. In February this predominance is very strongly marked, with only fourteen percent of the cyclones moving eastwards, but during March this predominance rapidly declines and eastward and westward movements are found with about equal frequencies. During the months of August and September the very rare cyclones always move towards the east.

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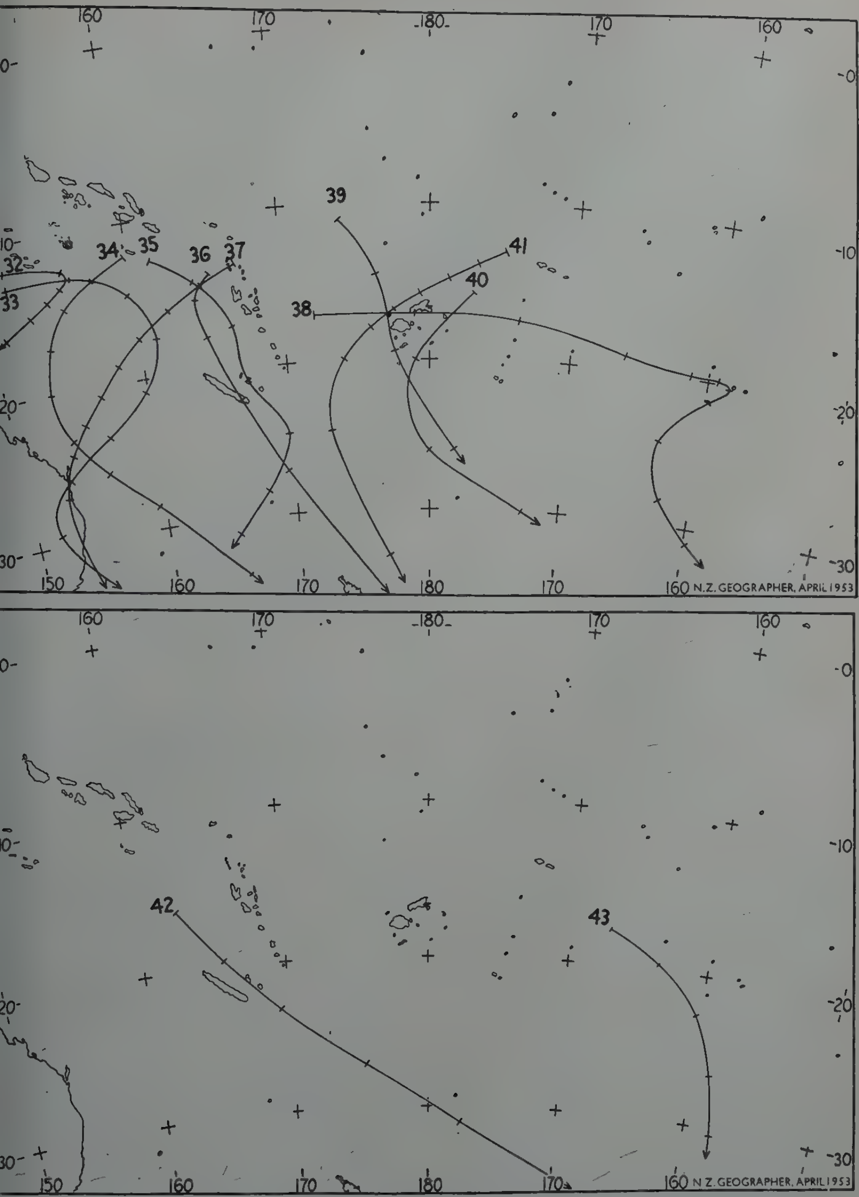
[10] I. R. Tannehill: *Hurricanes,* Princeton, N.J., 1938.



Figs. 8 and 9. Tracks of tropical disturbances which developed into tropical cyclones—March (above) and September (below).

These features of tropical cyclones in the southwest Pacific may be explained by reference to the mean wind distribution at upper levels and by the recognition of a steering principle in which the motion of small-scale lower tropospheric disturbances can be regarded as steered by the large-scale upper-level currents in which they are embedded.[11] A comparison of the June-August 300 mb. stream-line charts for the north Atlantic tropical region and the December-February chart for the southwest Pacific tropical belt shows clearly that in the former area there is a broad easterly current extending from the equator to latitude twenty degrees north, while in the southwest Pacific the tropical easterly current is relatively narrow and extends only from the equator to about latitude twelve degrees south over most of the region here considered. Thus it seems likely that any tropical disturbance moving in the mean flow has a much greater chance of being carried westwards in the Atlantic area than in the southwest Pacific.

TABLE V

FREQUENCY OF INITIAL EASTWARD OR WESTWARD MOTION OF TROPICAL DISTURBANCES

		Dec.	Jan.	Feb.	Mar.	Aug. Sept.	Total	Percent
Number of Cyclones		6	11	14	10	2	43	—
Initial Motion	Eastward	5	5	2	5	2	19	44
	Westward	1	6	12	5	0	24	56
Percentage Moving Eastwards		83	45	14	50	100	44	—

Since the necessary charts of monthly mean-flow patterns are not available little can be said about the strong variation with the advance of the season. There is, however, a rough guide to the kind of variation that might be expected on steering principles. Observations with radar wind-finding equipment at Nandi, Fiji, (in latitude eighteen degrees south) carried out over the period 1945-1951 have shown the distribution of the mean westerly component of wind at 30,000 feet in knots. From the information available (Table VI) and considering the seasonal averages of Brooks and others[12] it appears likely that the belt of tropical easterly winds south of the equator is relatively narrow in December, gradually broadens during January, and reaches its greatest width in February. During March the belt contracts and during August and September probably reaches its narrowest extent. The data on cyclone motion presented in Table V seem to be in close agreement with the above data on the mean wind distribution in this region.

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[11] For an amplification of this point see C. E. P. Brooks, *et al.*: 'Upper Winds over the World', *Geophysical Memoirs No. 85*, London, 1950.

[12] *ibid.*

It does not seem possible to apply the steering principal to the meridional movements of the cyclones and it seems likely that this meridional motion is controlled much more by the resultant of the horizontal forces acting on the vortex. This movement, the result of the vorticity distribution in the surrounding fluid, has been discussed by Rossby[13] and Kuo.[14]

TABLE VI

MEAN WESTERLY COMPONENT OF WIND AT 30,000 FEET IN KNOTS AT NANDI, FIJI, 1945–1951

	January	February	March	April	May	June
Mean Westerly Component (Knots)	+12.2	−0.4	+5.2	+16.8	+28.1	+17.4
Number of Observations	363	269	308	210	201	245
	July	**August**	**Sept.**	**October**	**Nov.**	**Dec.**
Mean Westerly Component (Knots)	+32.0	+29.9	+41.1	+32.7	+26.3	+15.7
Number of Observations	221	267	281	291	361	335

The speed of the disturbances along their paths varies rather widely. For disturbances moving towards the west speeds vary between five and fifteen knots, but for those moving eastwards speeds may be as low as five knots or as high as twenty-five to thirty knots. This may be seen by inspection of the trajectories in Figures 5–9. In these circumstances average figures for the speeds of disturbances in the southwest Pacific would seem to be of little value in practice and consequently have not been computed.

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[13] C. G. Rossby: 'On Displacements and Intensity Changes of Atmospheric Vortices', *Journ. Marine Res.*, Vol. 7, 1948, pp. 175–187; and *idem:* 'On a Mechanism for the Release of Potential Energy in the Atmosphere', *Journ. of Met.*, Vol. 6, No. 3, 1949, pp. 163–180.

[14] H. Kuo: 'The Motion of Atmospheric Vortices and the General Circulation', *Journ. of Met.*, Vol. 7, No. 4, pp. 247–258.

A NEW CLASSIFICATION AND MAP OF NEW ZEALAND VEGETATION

R. S. DICK

THE EARLIEST investigations by Europeans of the indigenous flora of New Zealand revealed that it possessed both a marked variety of species and communities, and a striking individuality when compared with other areas of the world.

This vegetation has since been the subject of study of numerous botanists and naturalists and a great wealth of detailed knowledge has accumulated. Today bold regional contrasts in the vegetation have become even more noticeable, with the widespread cultural changes resulting from the settlement of the country, and several of these areal differences are due to the presence of exotic plant communities. Of this 'alien' flora, the study of crops and pastures has received the most attention in recent years largely for economic reasons. But although the field of enquiry has been wide and the data assembled generally comprehensive, very few investigators have studied the areal distribution of major plant communities. Still fewer have attempted to map the vegetation of this country.

The need for such maps is widely and keenly felt. They have, apart from their geographic interest, valuable practical applications in the work of botanists, zoologists, geologists, pedologists and of those concerned with forestry, conservation, land-use planning and even military matters.

It was therefore decided, in spite of the present incomplete state of the data, to attempt to apply to New Zealand a method of classifying and mapping vegetation which it was anticipated might yield profitable results. This system was recently devised by an American plant geographer, A. W. Küchler, who is working towards a world classification of vegetation both primitive and contemporary. It is based on the recognition of some of the main differences in the physiognomy of plant communities. The characteristic appearance or physiognomy results from the association together of several readily observable features. Among the more important of these, are the abundance of particular growth forms (trees, shrubs, herbs, etc.), the height and layering of the vegetation, and also its density, variety and colour. If there are significant seasonal changes in the appearance of the plant cover, these are also indicated. In Küchler's classification[1] five main levels of subdivision are recognised. All are based on physiognomic qualities.

The entire plant kingdom is first divided into two major sections: woody plants and herbaceous plants. Each of these has a number of important classes. Five groupings of woody vegetation are distinguished: (i) broadleaf evergreen; (ii) broadleaf deciduous; (iii) needleleaf evergreen; (iv) needleleaf deciduous; and (v) without leaves. Less variation of a comparable nature occurs among the non-woody plant cover; three classes are here recognised. The vegetation may be dominated by forms which are (i) grass-like in appearance, or (ii) broadleaf herbaceous plants or (iii) occasionally ground mosses and lichens.

The remaining three criteria used to subdivide these eight major categories are the height and density of the vegetation and the occurrence of miscellaneous special features, for example the presence of lianas, palms, epiphytes or succulents. An outline of the system used by Küchler is presented in the tables below. Some New Zealand and world examples are given. It will be noted that there is some resemblance to Köppen's classification of climates insofar as letters are used to represent various physiognomic classes of vegetation. Major categories are expressed by capital letters; other important physiognomic features are indicated by the use of small letters (Tables I–V).

A deciduous broadleaf forest, from 10 to 25 metres in height with a herb layer not exceeding 0.5 metres would be shown as *DmHl*. A representative portion of savanna vegetation where continuous areas of tall grasses, over two metres high include groves of deciduous broadleaf trees would be indicated by *GtDp*.

The longer formula *Btmej.yr* is descriptive of an evergreen, broadleaf forest cover with tall and medium high trees forming two distinct layers. There are numerous epiphytes and lianas. Tree ferns while not abundant are so conspicuous that they cannot be ignored. The point is used here to show that the *r* refers only to the tree ferns. A heathland of dwarf shrubs with an undergrowth of low grasses and sedges is represented as *BzGl*.

The formulae for several major plant communities of New Zealand are listed in Table V.[2] One serious weakness is at once apparent.

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[1] For a full description of the scheme, see A. W. Küchler: 'A Geographic System of Vegetation', *Geogr. Rev.*, Vol. 37, No. 2, 1946; and *idem:* 'A Physiognomic Classification of Vegetation', *Anns. Assoc. Amer. Geogrs.*, Vol. 39, No. 3, 1949.

[2] It should be noted that a single major plant community may vary slightly from one area to another in a number of physiognomic traits. The three formulae given for manuka heath indicate differences in height and the appearance of the undergrowth.

Exotic pastures are indicated by the same formula as low tussock grassland (*Gl*). It is suggested, therefore, that an extra letter is here required to indicate a tussock growth form.

Küchler's scheme has been followed in the preparation of a vegetation map of New Zealand.[3] It was felt necessary, however, to distinguish (by the use of shading) between the grasslands referred to above. The maps presented are of necessity small scale, because there is a serious lack of detailed and up-to-date information on the distribution of nearly all the major plant communities. And as the separate mapping of all the main physiognomic types is not possible at present the grouping of formulae was necessary in some cases. (See legends to *Figs.* 1 and 2.) Although local details are unavoidably omitted on the map, the broader regional contrasts in vegetation may be readily distinguished.

In Northland, for example, the distinctive association together of extensive heathlands (*BsGl, BzGl* or *Bsz*), narrow ribbons or pockets of pasture (*Gl*), and numerous scattered areas of evergreen, broadleaf-podocarp forest (*Bmlejy*) is clearly shown. The fact that shrublands of very low height (*BzGl*)[4] occur more commonly there than in many other regions of New Zealand is not indicated because sufficiently detailed investigation has not been carried out. For the same reason it is not possible at present to differentiate throughout New Zealand between the larger sections of continuous shrubland and areas where a complex mosaic of this community and exotic grassland is characteristic (*BsGlp*), as for instance in many parts of Eastland.

The limits of the tussock and exotic grasslands of the South Island are reasonably well known and have been mapped, but unfortunately in this case there is no Küchler symbol to distinguish between them. The formula *Glibq,* however, describes accurately the main features of the depleted, low tussock vegetation which is mainly restricted to parts of Central Otago. A sparse growth of the tussock grasses such that the individual plants are not touching is indicated by *i*. The numerous patches of bare, and often eroded land are shown by the inclusion of *b*. The small letter *q* denotes the abundance of mat-forming plants (*Raoulia spp.*).

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[3] The main sources of basic data used in the preparation of the new map were L. Cockayne: *Vegetation in New Zealand,* Leipzig, 1928; K. B. Cumberland: 'A Century's Change: Natural to Cultural Vegetation in New Zealand', *Geogr. Rev.,* Vol. 31, No. 4, 1941, pp. 529-554; F. W. Hilgendorf: 'The Grasslands of the South Island of New Zealand: An Ecological Survey', *N.Z. Dept. of Sci. & Ind. Res. Bull. No 47,* 1935; E. A. Madden: 'The Grasslands of the North Island of New Zealand', *N.Z. Dept. of Sci. & Ind. Res. Bull. No. 79,* 1940; V. D. Zotov: 'Survey of the Tussock-Grasslands of the South Island, New Zealand', *N.Z. Dept. of Sci. & Ind. Res. Bull. No. 73,* 1939; New Zealand Topographic Maps, Provisional One Mile Series, as far as published.

[4] The widespread gumfields of Northland support a low form of heath vegetation. This dwarfing is especially marked on areas which have been repeatedly burnt over.

It is once again lack of data for many districts in the South Island which, at the moment, prevents the accurate delimitation of the extensive beech forests (*Bm*). In Westland landscapes, forests are always conspicuous. The widespread and intricate pattern of heathland, swamp vegetation, and limited areas of grassland is also characteristic. But these particular features cannot be adequately shown on the map presented. The main reason for this omission is the limitation imposed by the small scale of the map.

There is abundant evidence to demonstrate the need for accurate investigations into the local distribution of plant communities in New Zealand. No standardised and dominion-wide scheme for mapping the areal extent of the major plant communities has so far been proposed. It is hoped that in the future, medium-scale maps of New Zealand (e.g. 1 : 250,000) showing the distribution of physiognomic types will be produced.

A fuller understanding of the plant-geographic character of areas would then be possible, and the maps would provide a sound basis for further research in many fields where a knowledge of vegetation has practical application.

TABLE I

CLASSES OF WOODY AND HERBACEOUS VEGETATION

WOODY VEGETATION

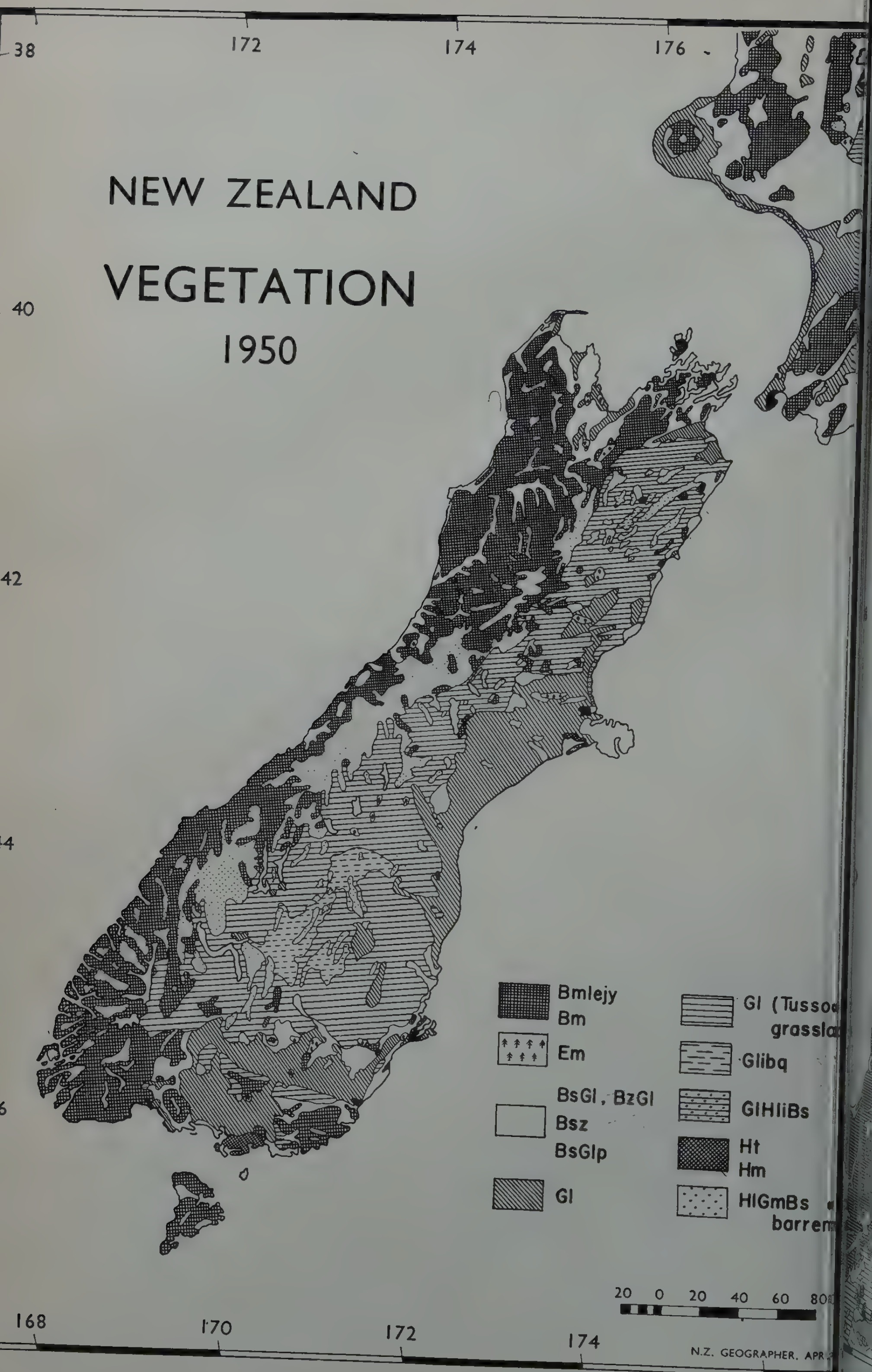
B—evergreen broadleaf. Forests of equatorial lowland regions without a distinct dry season, Mediterranean sclerophyll woodlands, forests of southern Chile, the eucalypt forests of southeast Australia. In New Zealand—broadleaf-podocarp 'bush', beech forest, manuka heath.

D—deciduous broadleaf. Many of the European oak woodlands, beech forests of Europe, forests of equatorial lowland regions with a distinct dry season, the caatinga of the northeastern drought area of Brazil. Only locally represented in New Zealand—e.g. apple orchards.

E—evergreen needleleaf or coniferous. (This class also includes leaves that are more scale-like in appearance, e.g. many cypresses, macrocarpa, kahikatea, rimu.) Most of the taiga, coniferous forests elsewhere in Europe, forests of pine, fir, spruce and cedar in Oregon, Washington and British Columbia. In New Zealand—kahikatea swamp forest, pine plantations.

N—deciduous needleleaf. Larch forests in the taiga of northeastern Siberia and eastern Canada.

O—leaves absent. This applies mainly to plants which have chlorophyll in their stems: cacti, some *Euphorbia spp.;* some brooms, etc. The class has a very restricted areal extent.


NEW ZEALAND
VEGETATION
1950
38
40
42
44
46
168
170
172
174
176
Bmlejy
Bm
Em
BsGl, BzGl
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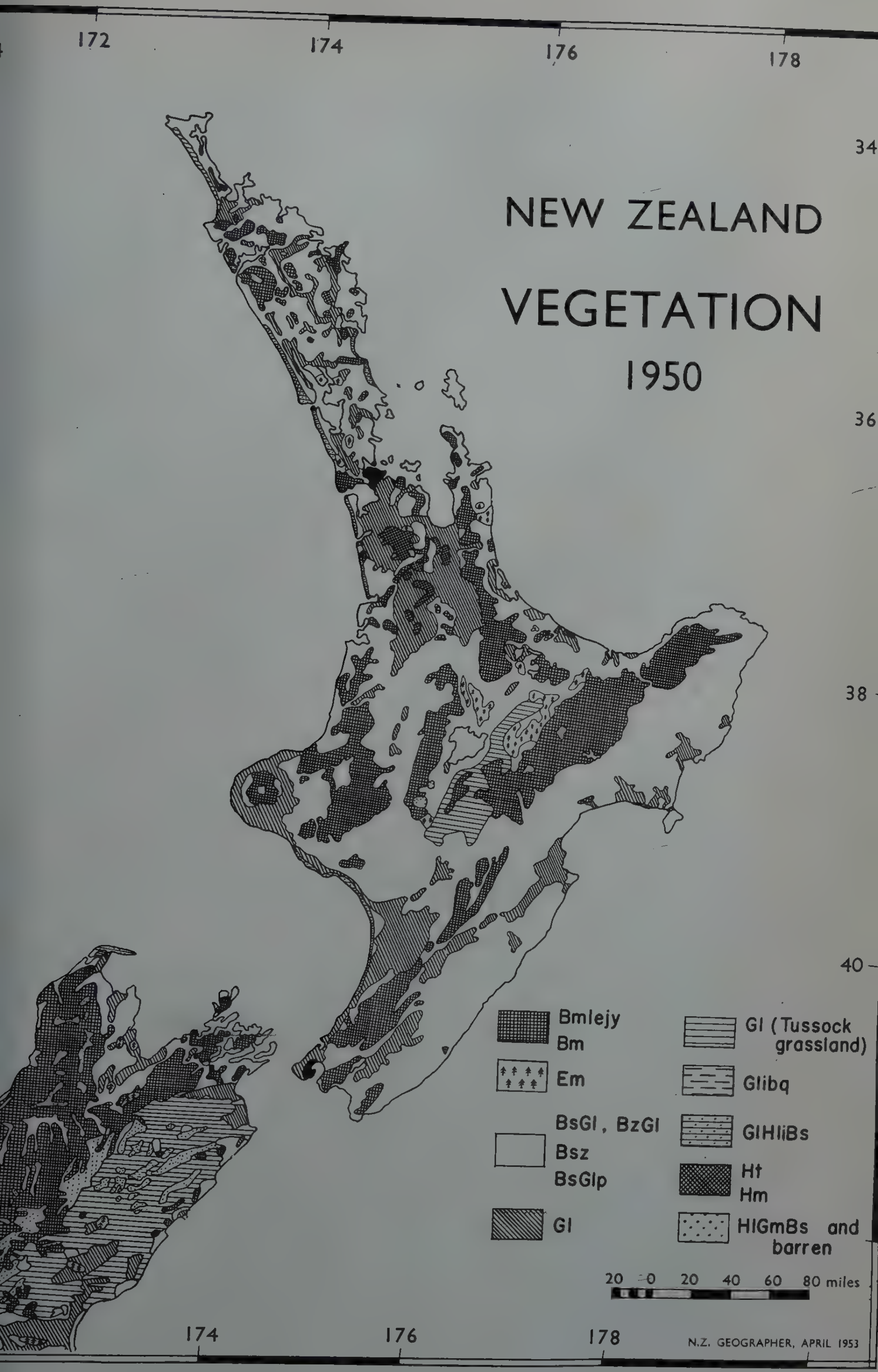

N.Z. GEOGRAPHER, APRIL 1953

Figs. 1 and 2. The vegetation of New Zealand. (See Tables I – V.)

Non-Woody Vegetation

G—*plants which are grass-like in appearance*. This includes grasses, sedges, rushes and reeds, the North American prairie, extensive areas of the pampa of Argentina, the high veld of Transvaal and large areas of the tundra. In New Zealand—tussock grassland, exotic pastures and sedge swamps.

H—*broadleaf herbaceous plants*. These are commonly referred to as forbs. They often occur as the ground cover of forests and abundantly in subalpine and alpine vegetation, and in sand-dune areas.

TABLE II

Distinctions According to Height

	Woody Vegetation	Non-Woody Vegetation
t—tall (average minimum height)	25m. (82ft.)	2m. (6ft. 6ins.)
m—medium high	10-25m. (33-82ft.)	½m.-2m. (1ft. 7ins. to 6ft. 6ins.)
l—low (average maximum height)	10m. (33ft.)	½m. (1ft. 7ins.)
s—shrubs (minimum height)	1m. (3ft. 4ins.)	——
z—dwarf shrubs (maximum height)	1m. (3ft. 3ins.)	——

TABLE III

Differences in Density

c—a continuous dense growth.

i—individual plants are so spaced that they usually do not touch, e.g. bunch grass of the prairies, and in New Zealand the vegetation of depleted tussock in parts of Central Otago.

p—implies a discontinuous or patchy distribution of a physiognomic plant grouping, e.g. groves of trees in the savannas, patches of pasture or sedge swamp in the manuka heathlands of New Zealand.

r—a rare but particularly conspicuous type of vegetation, e.g. the occasional grove of kauri in many of the forested areas of Northland, New Zealand.

b—vegetation is largely or entirely absent, e.g. talus slopes and areas of drifting sand.

TABLE IV

Special Physiognomic Features

e—epiphytes
j—woody lianas
k—succulents
q—cushion plants
u—palms
v—bamboos

w—aquatic vegetation which is either submerged or floating. If the plants are rooted below the water but carry important parts above the surface (e.g. mangroves, reeds, sedges) they are not included here, but would fall in the *B* or *G* categories.

y—tree ferns and tuft plants. An example of the latter in New Zealand is the cabbage tree, *Cordyline australis*.

TABLE V

PHYSIOGNOMIC FORMULAE FOR SOME NEW ZEALAND PLANT COMMUNITIES

New Zealand Plant Community	*Appropriate Formulae*
Beech forest	*Bm*
Mixed broadleaf-podocarp forest	*Bmlejy*
Mangrove 'forest'	*Bl*
Kahikatea swamp forest	*Et*
Pine plantations	*Em*
Manuka shrubland	*BsGl* *BzGl* *Bls*
Low tussock grassland	*Gl*
Exotic pastures	*Gl*
Depleted tussock grassland	*Glibq*
Sand-dune vegetation	*GlHliBs*
Flax or raupo swamp vegetation	*Ht* *Hm*
Herb field and mountain shrub communities	*HlGm Bs*

Note: *b* may be used to indicate presence of barren areas (e.g. scree slopes, mountain tops, bare and eroded land).

GEOGRAPHY IN SCHOOLS . . . .

3. *GEOGRAPHY AND SOCIAL STUDIES IN THE POST-PRIMARY SCHOOL*

Averilda Gorrie

GEOGRAPHY is a study of the earth's surface; it may not properly be defined as the study of man. A social study, on the other hand, is nothing if it be not a study of man in society, in either past or contemporaneous communities. It would seem then that here are two disciplines, symbiotic no doubt, but distinct. Since 1945 there has been a post-primary school subject called 'social studies' designed for lower forms, and a subject called 'geography' for school certificate, university entrance and university scholarship examinations.

When the subject social studies was introduced into the post-primary schools as one of the six compulsory core subjects, its title, it should be noted, was in the plural. The point is that educationists responsible for the new curriculum chose no single social study, such as sociology or anthropology or history, but more or less created a new subject, hybrid in character and not very happily so. The new hybrid was also rather different from social studies as practised in most American and Canadian state schools at that time. Confusion immediately arose for the only available literature of principles and methodology was American and was naturally related to the purer American concept of social studies. It could not satisfactorily be grafted upon the local compromise.

In this note it is proposed to examine the nature of geography, to discover what precisely is meant by social studies in New Zealand, and then to make the suggestion that, while there is at present confusion about the methodology and content of geography and social studies as they stand, a slight change of wording in the official social studies syllabus would remove the fundamental reason for any confusion or cleavage. The alteration would make social studies a covering term for a course in regional geography and in history. This twist, whilst taking from the syllabus most of the criticism a geographer could level at it, would also preserve the spirit and intention of the original text.

THE GEOGRAPHIC APPROACH

Geography is a study of the earth's surface. The geographer may make his study either by a systematic review of one cultural or physical element over the face of the globe or in some chosen area, and/or by a study of all elements as they occur in a particular place. The geographer is perhaps most truly himself when he studies the total character of some region for then, through his observation, description and interpretation he can tell us what the place is like and so perform a service which no other discipline attempts. From a study of a number of regions the geographer is able to employ comparative methods to differentiate between them. Since man is a feature of most regions and his influence upon the landscape inescapable, though variable in time and space, his activities are observed and described. Quite frequently, as for example in a study of the Low Countries, the cultural aspects become predominant, but this does not make regional geography a study of man. In many regions, political, social and economic factors, insofar as they are reflected in human occupance, become for the purposes of the particular regional study geographic factors —or, better, factors relevant to geographic studies. Human interdependence, the challenges of nature to man and man's peculiar responses, claim the geographer's attention. The fact that regional geography can thus hardly escape portraying man as a social phenomenon does not make geography a social study by definition but only by content. Whilst accepting the fact that human phenomena constitute highly significant data in most regional and all systematic cultural geography, it does not follow that these together constitute the whole field of geographic science. In the study of systematic geography physical phenomena might legitimately be examined without any reference to man and his works.

Geography as a Social Study

Educationists who are not also geographers need to respect the fact that geography is a study of the earth's surface and to accept the implications. Geographers who want also to be educationists need to concede, with Derwent Whittlesey,[1] that for purposes of the post-primary school, geography while preserving its essential nature, must wherever possible be used for social purposes. In point of fact no better vehicle could be found. To say that geography should be used for social purposes is to imply two courses of action: first, that emphasis should be placed upon regional studies of areas inhabited by man; and second, that some of the vital modern problems such as the world's food supply, resource conservation and Japan's industrial and military potential—topics which emerge from the general course—should be made integral parts of the whole and not left practically unheeded in the borderland between subjects. Any educational system which neglects or but carelessly regards this fringe misses reality for children and abdicates its main chance of producing an informed and curious generation.

In view of the paucity of literature on social studies in New Zealand, the only practical way of finding out what is meant by the subject in this country is to study the official syllabus of 1945. This reads as follows:

'(a) Study of the Social life of the pupil's own local community and of New Zealand as a whole in relation to the geographical environment and historical background.

(b) Study of the social life and organisation of the major peoples of the contemporary world in relation to their geographical environments and historical development. Special attention is to be given to the main parts of the British Commonwealth and to important non-British countries bordering on the Pacific.

(c) A general survey of the origins and growth of Western Civilisation, with special reference to the history of the British Empire and Commonwealth

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[1] See D. Whittlesey: 'Picturing Human Societies in their Habitats,' in C. F. Kohn (Ed.): *Geographic Approaches to Social Education*. Washington, 1948.

> and of New Zealand, and of the growth of democratic ways of life. Emphasis will be placed on the contributions to civilisation, material and non-material, of different peoples and periods; on the succession of social and economic systems and the changes in outlook and everyday life accompanying them; on the accumulation of knowledge and learning and on the advance of science, technology and invention, and on the social implications of that advance.'

As it stands the first part of this definition commits the teacher first to a social survey of a local area, not to a geographic survey. That third-form pupils are usually too immature to profit from any such attempt, and that many environments scarcely lend themselves to so restricted an investigation, is the claim of most practising teachers. Instead they, in desperation, have resorted to so-called project activities —assignments really—whereby pupils investigate and write up local industries, transport systems or public utilities. That some valuable work, both in method and in obtaining a greater understanding of human affairs, has been done, is not denied, but it must be admitted that whatever these so-called social studies can possibly achieve, regional geography can achieve infinitely better.

What is the 'Geographical Environment'?

This first part also involves the teacher in an examination of social matters in New Zealand as a whole. It is felt that such work is not properly the natural province of any sound fifth-form school certificate course in geography. What precisely is meant by '. . . in relation to the geographical environment . . .' is not clear, for the phrase 'geographical environment' needs definition before one can be sure that everybody is speaking the same language. One has the uncomfortable suspicion that physical environment is implied and if so, the door to an unscientific environmentalism is thereby held wide open.

The second part, as it stands, asks for a study of social life and organisation (whatever this last may mean) among selected contemporary peoples. All that has been said already in regard to the local and national surveys may well be repeated. That the word 'social' has a capital letter in part (a) and no capital in part (b) may have some significance, but none that is self-evident.

The third part is history and as such need not concern us here, except to say that the idea that history and geography belong to the same field of knowledge is quite wrong; their integration is one of purpose but not of subject matter.

Taking Liberties with the Syllabus

Whatever the possible merits of the 1945 syllabus as it stands, it is neither fish nor fowl. Any geographer looking at it must say it contains no geography. He will of course lament this fact for he knows that geography can do so well what the social studies syllabus is trying to do. Moreover, the social studies expert from the United States, for example, looking at the New Zealand syllabus, is bound to say it is not really social studies.

In point of fact, after some abortive attempts to implement the syllabus literally, a great many teachers, as their schemes show, have taken the liberty of changing its wording. Parts (a) and (b) have been altered to read:

'(a) The geography of the pupil's own immediate locality and of the larger regions of New Zealand.

(b) The geography of selected areas occupied by the major peoples of the contemporary world. Special attention is to be given to the main parts of the British Commonwealth and to important non-British countries bordering on the Pacific.'

The first part has thus become, first, a normal geographic survey of a small area and then a series of regional studies in New Zealand geography. In both, relevant social characteristics and historical backgrounds are investigated and described. There is no need to insert any special injunction, for the geography teacher knows his business. If any particular social aspect of a region warrants special and extended attention, a good teacher will afford it time.

The Local Area

The local survey, now possibly a regional study of a small area, is of supreme value. Teacher and pupil attempt to assess the character of their immediate area to find out to what it owes its individuality. No better introduction to mapping, to observational techniques, to the alphabet and language of geography, and to an understanding of the nature of the subject could possibly be given to a third-former. What is perhaps more important, there is no better or more tangible way of introducing him to man in society than to analyse and examine what to him is the best-known area of all, to see its pattern of settlement, communications and land use. To miss the opportunity of surveying the geography of the local area is to miss the alphabet, to be in Venice and pass the Doge's palace by.

In conducting a regional survey of New Zealand geography, the teacher has the *Post-Primary School Bulletin*, the *New Zealand Journal of Agriculture*, the 1 : 63,000 and 1 : 25,000 series of topographic maps and a wealth of photographic material.

The second part has also become regional geography. Its possible contribution to the cause of human understanding has already been put forward. Its value as a basis for school certificate courses in geography and to more advanced studies of the subject is obvious.

Where the core syllabus is altered and used as here outlined, there is no conflict between what is done in the upper and lower classes. What is more, the early leaver will have had something substantial and meaningful. With geographic method kept intact, he will, through these regional studies, have worked outwards from the known home area; he will have some insight into what other places are like and how men use and organise their natural resources; and he will have had some introduction to appropriate systematic studies both cultural and physical, for regional geography demands this support. He will have had the opportunity to discuss and sometimes to prepare his own work on problems that emerge from the main course.

A specific example will illustrate this. Recently a small group of low-grade fourth-formers, who had been studying Japan under the second part of the social studies syllabus, became very keen about the problem of Japanese reconstruction. Their genuine feeling of inquiry led to a short-term piece of investigation. Some diligent fact-finding resulted in a very good survey presented in an English period to the whole class (some of whom did not take geography). The presentation took the form of a panel of speakers chaired by a Chinese boy who had led the assignment. Most adults in New Zealand would have profited by hearing the factual information. The intelligence and the penetration of the questions asked by the audience was a revelation of interests. The class was alive.

There is one further point about the nature of geography, and a further warning to be given in regard to it. While geography is first of all a matter of observation and description it is also, of course, interpretative. Now explanations as to why a region has its particular personality, why a metallurgical industry has grown up here or rubber plantations there, are rarely simple. Undoubtedly interpretation involving causalities lies more in the province of advanced geography than in that of the schoolroom with its limited factual knowledge. Teachers are wise to be very careful about explanations as to 'why', and to remember that oversimplification so often leads to environmentalism of the 'wheat is grown on the Canterbury plains because there is less than 35 inches of rain' type. Many teachers, rushing constantly into simple explanations or easy generalisations give their pupils the false impression that the causes of human actions are always entirely physical. Teachers of geography cannot however abandon explanation and interpretation in the classroom. This would be impossible by the very nature of the subject, but it is suggested that, with third and fourth forms, they would be wise to limit their excursions into causalities, deliberately selecting, however, for these young pupils and for school certificate candidates, opportunities which will show the diversity of causes, the complexity of factors at work and the varying significance of the physical considerations.

In this way pupils would be made aware of the dangers of environmentalism, of oversimplification, and would be trained to see the need to weigh evidence, to seek beyond the obvious, and to accept the complexity of things. They would see man as he really is, influenced by a variety of things—his historical background and inherited techniques, his politicians, his need for money, his whims, the climate, the soil, the configuration of the land, his ingenuity, and the pressure of his necessity—what better social study? All this cannot be taught in a hurry, but only gradually through selected examples from third form to the sixth. If the teacher will give great thought and some real research to his selected opportunities for this discussion of causes, he will be doing a service not only to geography but to the cause of education as a whole.

Revision of the Syllabus

It remains now to suggest two things. First that the time is opportune for some revision of the existing social studies syllabus if only to bring it into line with practice. Such rewording of the text as has been suggested, or some alteration to make parts (a) and (b) geographic in the regional sense, would maintain the original good intentions of its makers, and at the same time preserve the excellent discipline of geography. Secondly, it is suggested that there could be two alternative core subjects, one called 'geography and history' and the other 'social studies'. Post-primary schools would have the right to adopt either or both as befitted the needs of different classes within one grade. The geography in the first syllabus would be regional geography along lines already suggested. The teacher undertaking the course would not only make it a solid prerequisite for later geography but over and above this he would see that the work helped to fulfil one of the main educational aims, that of training, as far as is possible, in international understanding and world citizenship.

Alongside this course with its more traditional academic approach and additional modern quality, the alternative syllabus would be called social studies and would consist of problem topics for teacher and pupil investigation. A wide range of such topics could be provided by the Department of Education, leaving teachers free to select from the list. Such topics could in the first instance be suggested by teachers all over the country, and a committee set up to make the final departmental choice. Problems such as the world's food supply, the menace of soil erosion, the rise of Asia, present-day ideologies and making a model city, are envisaged. The department might publish a handbook of suggestions for the organisation of each topic, bibliographies and appropriate visual aids. Such a course in the hands of a capable teacher would be an inspiration. Now, as has already been claimed, important topics such as these mentioned are not omitted from a properly-run course in geography and history, and so at first sight it might appear that social studies is unnecessary in a good school where geography and history are taught; but it is here maintained that to a great many children the direct approach to problem topics makes a greater appeal than does the academic, however well conducted. The need for social studies is put forward then, not because geography and history are now found wanting, but because the social studies approach is more educationally sound for certain types of pupil. If two such core courses were available, with their different approaches but identical aims, there would have to be a subject social studies for school certificate.

Space does not here permit one to suggest its factual content, but it could be a sound, substantial subject. That either course, geography and history, or social studies, can become vague, nebulous, lacking in concrete fact and precision, or as dry as dust is not for one moment denied, and that social studies is more prone to such dangers is readily conceded; but it is pointless to dwell upon the endless possibilities of bad teaching.

NEW ZEALAND IN AMERICAN EYES: A REVIEW

HOWARD J. CRITCHFIELD

IS THERE a New Zealander who has visited the United States and who cannot relate at least one personal incident which reflects misconceptions of New Zealand's people, government, or geography? An American meets a visiting New Zealander and expresses surprise that the latter can speak English so well. Or he mistakenly identifies New Zealand with Australia: 'Do you see many kangaroos?' 'I saw Brisbane and Sydney but never got to Wellington.'

Since the signing of the Tripartite Security Treaty in 1951 by Australia, New Zealand and the United States and the more recent ANZUS meetings in Honolulu there has been a partial reawakening of the American interest in the Pacific which reached its peak during the second World War. The impressions of New Zealand held by the average American are a synthesis of occasional news items or magazine articles and the verbal accounts of persons, usually tourists, who have visited the dominion. Since a relatively small number of Americans visit New Zealand and the average duration of their stay is short, information available through these channels is limited and sometimes misleading. Consider the instructor in geography from an American university who made a two-week tour of the North and South Islands deliberately avoiding the principal tourist attractions because 'everybody goes there'. Subsequently this individual was listed in a directory of geographers as having 'first-hand knowledge of New Zealand'.

QUOT HOMINES, TOT SENTENTIAE

In the pages of three postwar articles appearing in American publications American readers are given vicarious glimpses of New Zealand.[1] One reads in Michener that 'New Zealand is probably the most beautiful country on earth', and that, according to Walker, the country is 'a miniature universe of natural marvels'. As for the people, Robinson declares that 'their speech, manner, and attitudes were so much like our own that I could scarcely believe that I was in a foreign country'. New Zealanders will no doubt agree with the spirit of these statements. Indeed Michener says that he has 'never met people more deeply convinced that theirs is the one good land'.

It is understandable that reports of the few Americans who travel to New Zealand should form the basis for the popular American conception of the dominion and its people. Different visitors see different things, however, and it is significant that several of the interesting points dealt with in the articles which contain the above quotations are frequently belaboured in letters-to-the-editor columns of the New Zealand newspapers.

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[1] J. A. Michener: 'New Zealand', *Holiday*, January, 1951, pp. 44-47 and 71-77; W. M. Robinson: 'A Georgian in New Zealand', *The Georgia Review*, Vol. III, No. 4, 1949-50, pp. 379-390; and H. Walker: 'New Zealand, Pocket Wonder World', *National Geographic Magazine*, April 1952, pp. 419-460.

One point of common agreement among Americans who have visited New Zealand is the country's scenic beauty. Nature has run the gamut in landforms and produced a laboratory of geomorphology filled with spectacular examples to delight the scientist as well as the tourist. Popular interpretation of these landforms by Americans can on occasion be amusing or even misleading. Lumping monadnocks and volcanic cones into the same category, Robinson describes Mt. Egmont as rising 'above the countryside unconnected with any mountain range . . . like Fujiyama in Japan and Stone Mountain in Georgia'. Although it is an interesting landform, Stone Mountain undoubtedly gains the greater benefit from this association. Michener says, 'New Zealand has dozens of fiords still to be opened to travel'. One can only wonder whether this error is geomorphological or arithmetical.

The native bush, especially that of the rainforest areas of Westland and Fiordland, and the kauris of Northland invariably attract attention, and rightly so. But few visitors have an appreciation of the beech forest or the tussock grasslands, and it is a rare American who can go beyond the kiwi, moa, and *Notornis* in a discussion of New Zealand birdlife. To the American perhaps even more than to the New Zealander the kiwi symbolises New Zealand.

Of course the superficial approach of the tourist is not peculiar to Americans. It is to be expected that the more spectacular scenic attractions will have the greatest drawing power. It would be unrealistic to assume that a tourist should make a complete geographic reconnaissance of the islands. Having sampled only a few of the most accessible points of interest, however, he would most certainly come away with favourable impressions of the natural wonders.

HOTEL ACCOMMODATION

What many tourists seem to object to is not the quality of the scenery but the general character of the hotel and resort facilities. Robinson states that the lack of heating in public places was the one thing that 'made me feel like a stranger in a foreign land. A few bedrooms in the hotel had fireplaces but apparently only invalids were expected to ask for fires. Never once did I find a heated bathroom in New Zealand'. This is an old issue to New Zealanders, most of whom have rationalised the problem in their own minds. Whether or not New Zealanders wish to exploit their scenic resource to gain dollar currency is a matter for them to decide. Unquestionably the extent to which they will be able to attract American tourist dollars depends on the amenities provided at hotels and resorts as much as the inherent quality of the scenic resource.

Closely allied to hotel accommodation is the question of food. Probably the most fundamental difference between New Zealand and American menus is the greater emphasis of the former upon meat, especially lamb and mutton. Despite New Zealand's reputation for producing quality fat lambs, items such as whitebait, oysters, and crayfish are more often applauded by visitors. Walker pronounces toheroa soup the 'most palatable and satisfying soup I have ever tasted anywhere, including France'. Another feature of New Zealand eating mores which impresses Americans is the number of 'meals' eaten each day. Robinson comments on this in describing his stay at a sheep station in Southland: 'The early evening dinner was delicious and not so different from what we might have had in Georgia. About ten o'clock we had supper or evening tea, with all the delicious cakes, cheeses, and sandwiches. . . . I stand amazed that the New Zealanders are not a fat people.'

Whatever else Americans may think unique about New Zealanders, friendliness and hospitality are characteristics which will always be remembered by those who have visited the dominion. Beyond this there is little in the make-up of a New Zealander or his way of life that a casual visitor would wish to examine critically. When Americans have had something adverse to say about New Zealand they have usually expressed themselves with candour and zeal while in the dominion, where their utterances receive more attention than they deserve. The New Zealand attitude towards work, for example, seems to bother some Americans. One schooled in American economic and social philosophy finds the greatest difficulty in understanding how it is possible for such combinations as a serious labour shortage and weeks with 'two Sundays' to coexist in the same country. New Zealanders apparently explain this simply as one of the expressions of social progress and a high standard of living. Some Americans think it is a factor contributing to a declining standard of living in the country.

'The typical New Zealander is rather shorter than the average American, and slimmer, too. He wears gray flannel trousers, an expensive sleeveless sweater, and a trim sports coat. . . . Along with the Spaniard he is probably the most conservative white man still living.' Thus Michener describes the New Zealand male. Robinson learned that 'all New Zealanders wear long woollens next to the skin . . .' and they behaved 'at Rotary meetings and in their homes precisely as we do in Georgia.' Were an objective anthropological study to be made of the New Zealand people, some attention would have to be given to such striking cultural phenomena as cigarette-rolling techniques, the five o'clock 'pub crawl', Saturday race meetings, and lottery tickets.

NEW ZEALAND IDIOM

The New Zealander's version of the English language and Maori place names never fail to intrigue Americans. Some words such as tucker, hogget, swag, bowser, and saveloy are completely foreign. Others have different connotations. Homely is a synonym for ugly in the United States, and homey is used with virtually the same meaning as the New Zealand homely. Crook denotes a criminal or 'shady character'; an American doesn't 'feel crook'—he 'feels lousy'; nor does he 'go crook' —'he blows his top'. Rather than 'have a yarn' he 'chews the fat' and is likely to 'brag' instead of 'skite', 'rummage' instead of 'fossick', 'get along with' instead of 'make do with', 'hunt' instead of 'shoot', 'cram' instead of 'swot', and end a sentence with a 'period' instead of a 'full stop'. To an American a 'scone' is a 'biscuit' and a 'biscuit' is a 'cookie'; a 'travelling rug' is a 'robe', the 'pictures' are 'movies', 'cocksfoot' is 'orchard grass', 'lucerne' is 'alfalfa', and a 'goods train' is a 'freight train', on which the 'guard's van' is the 'caboose'.

Place names like Onehunga, Petone, Paraparaumu, or Paekakariki are probably no more striking than Androscoggin, Okefenokee, or Wakiakum, but they are as hard to pronounce. New Zealand abbreviations like 'Paraparam', 'Waimak' and 'Waka' tend to add to the confusion for the visitor.

Americans always appreciate the controversies between the North and South Islands, and some find in them a parallel to sectionalism in the United States. Any similarity between Cook Strait and the Mason-Dixon Line is certainly superficial. Yet Robinson tries to draw a Southland family into the American North-South argument: 'My hosts had visited America and expressed gratifying preference for the South'. Nor can he resist the temptation to compare the status of the Maori with that of the Negro, pointing out that 'in both Church and State the Maoris and whites are segregated; they worship in separate parishes and dioceses and vote in separate election districts'.[2]

INTERISLAND CONTRASTS

An occasional New Zealander will agree completely with Michener when he sums up the character of the two islands thus: 'The North Island is progressive, industrial and butter. South Island is conservative, agricultural, and sheep. North Island is the smaller, the less beautiful, the more developed, and the more heavily populated. South Islanders pride themselves on being better educated, more loyal to England, and more substantial in all ways.'

Sooner or later New Zealand parochialism resolves itself into a division on a city basis. One of the nastiest jibes a South Islander can make at the North is an implication that Auckland is too American. No one really gets angry about this because Americans and Aucklanders interpret it as a compliment. Balancing the argument Michener writes of 'placid Christchurch with its English cathedral and stuffy manner'. In the eyes of Robinson this same Christchurch is a 'veritable garden city with a pretty little river (the Avon) meandering through it'. Weather is always a bone of contention, too. 'A discussion of Dunedin's highlights invariably begins brightly with its academic atmosphere and ends with a dour description of its weather,' says Walker. But Nelson warmly claims more sunshine than any other town in the dominion. Robinson must have discovered the following bit of information by making an impartial public opinion survey among Dunedin residents: 'Dunedin is the educational centre of New Zealand.'

The fact that these expressions of sectionalism have been given so much attention in American writings is of greater significance than at first meets the eye. It demonstrates the inability of New Zealanders to 'sell' the average visitor the really important features of New Zealand and its population. Although he gave a good account of some of New Zealand's peculiar customs, Michener obviously received only a cursory introduction to New Zealand agricultural and pastoral production. His oversimplified account of the development of New Zealand grasslands sounds like a paragraph of modern science fiction: 'Scientists discovered that New Zealand's grass could be the world's best except for a lack of cobalt in the soil. Now the blue mineral is added each year, sometimes by airplane, and the pasturage is spectacularly rich.' Much credit is certainly due those who investigated cobalt deficiency in New Zealand soils, but that work was only one link in the chain of research and experimentation which has led to establishment of high-quality pastures on a variety of soil types. From Michener's discussion of the sheep industry one gets the impression that the dominant breed is the merino, produced on large stations of which Lilybank and Mesopotamia are typical. Romney Marsh, Southdown and other English breeds of sheep are apparently inconsequential. Walker brings the sheep-farming industry into somewhat better focus: 'Sheep outnumber people by almost seventeen and one-half to one. . . . Fifth among the world's flock owners, the country exports more mutton and lamb than any other; it stands third in wool production and second in its export.' Those Americans who lump Australia and New Zealand together geographically are prone to think of New Zealand as a wool producer only.

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[2] Robinson: *op. cit.*, p. 386. See also on this subject: R. L. Meek, 'Some Features of New Zealand's Racial Problem', *N. Z. Geographer*, Vol. 3, No. 1, April 1947, pp. 75–82.

Since no mention is made of cheese, one concludes from Michener's article that he discovered only butter in his examination of the dairy industry. But among many American dairy farmers there is more than a passing knowledge of New Zealand dairying, and generally there is admiration for the production methods of dairying regions like Taranaki or the Waikato, whether these places are known by name or not. New Zealand strains of cocksfoot, ryegrass and white clover are gradually being introduced into American pastures. An increasing number of American dairymen are adopting similar ideas in pasture management and arrangement of milking sheds, although not all areas of the United States are so well-favoured for year-round pasture as are the dairying regions of the North Island. On the other hand, few will accept without question this statement by a North Island dairy farmer as quoted by Walker: 'When you buy a farm in New Zealand you automatically get all the livestock feed you'll need. It's just there, natural-like, and always growing, too.' This must surely be a Utopian dairyland!

SOIL EROSION PROBLEMS

Americans have been amazingly discreet about the scars of soil erosion on the face of New ~~Zealand. This results sometimes from~~ poor observation and sometimes from an acute awareness of similar maltreatment of the land at home. In this latter respect Americans are certainly in no position to point the finger of shame. Yet anything more than the most superficial discourse upon the man-land relationship in New Zealand must include reference to the problem of soil erosion. It is reasonable to expect that New Zealand agriculturalists should develop methods for restoring abused high-country tussock grasslands using technical principles similar to those employed in the establishment of productive exotic pastures. The three American writers who are quoted here seem not to have been aware of the extent of man-induced soil erosion in New Zealand nor of the conservation problem which farmers and scientists face. It should be pointed out, however, that there are Americans who recognise soil erosion when they see it and who realise its significance.[3] Such persons are as concerned about the waste of soil in New Zealand as in the United States.

A facet of the geography of New Zealand which fascinates many Americans is the amazing story of the ecology of introduced plants and animals. The way in which Monterey pine (*Pinus radiata*) has adapted itself to the New Zealand environment and grown so remarkably well is a phenomenon of never-ending interest.

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[3] See R. C. Murphy: 'Man and Nature in New Zealand', *N.Z. Geographer,* Vol. 8, No. 1, April 1952, pp. 12 and 13.

But even more astounding is the rate of spread of rabbits and deer. One phase of the rather extensive programme of introduction of exotics which pleases the tourist is the establishment of North American fish in rivers and lakes. This has created what Michener terms an 'angler's heaven'. As for the deer problem, the reports of deer 'infestation' and the large numbers of deer killed are generally greeted with incredulity. A willingness to accept the term 'sportsman's paradise' as probably accurate is not often accompanied by even an elementary appreciation of the complex ecological problems which are associated with animal introduction. A sportsman's paradise can be a biologist's dilemma. The disturbance of the ecological balance occasioned by the introduction of certain plants and animals will occupy scientists for some time to come as a subject for research. It is unfortunate that several of the introduced species have created serious problems in connection with native flora, birdlife, the soil, or agriculture. Having come face to face with the dangers of bringing plants and animals into a new environment New Zealanders will be more cautious in the future. Meanwhile the entire world may profit from careful analysis of the mistakes of the past.

The observation is frequently made that New Zealanders have a fairly good general knowledge of the people, government, and geography of the United States but that Americans know little or nothing of New Zealand. This is to a large extent true, but it should be pointed out that information relative to the United States is generally more available. The opportunities for Americans to read reliable descriptions of the contemporary New Zealand scene are surprisingly limited. While it is true that the approach of an outsider is often more refreshing and provocative, New Zealanders are themselves clearly remiss in providing the rest of the world with a complete picture of their country. There are numberless features of the physical and cultural landscapes which are largely taken for granted but which could be interestingly presented for the edification of readers abroad, and perhaps at home as well. It is not enough to say, hear, read, and believe that 'New Zealand is probably the most beautiful country on earth'. A detailed examination of cause and effect is required, and in spite of the excellent quality of past contributions in various fields of physical and social science, the way is clear for much more research work along many lines. If regional differentiation in the man-land relationship is the peculiar province of geographic science, then New Zealand surely is one of the most compact and complete geographic laboratories available. Whether a geographer wishes to pursue research in systematic or regional phases of his field the opportunities are legion.

A Fertile Field for Research

There is no better place than photogenic New Zealand to compile a photographic catalogue of landforms. From a thorough study of the atmospheric processes which characterise the transition from subantarctic to subtropical in New Zealand much might be concluded which would enhance our understanding of the world pattern of climate. The subtle differences in microclimates and their effect upon all forms of life offer an especially complex area for investigation. In the fields of oceanography, marine biology, plant and animal ecology, and geology there are other rich and challenging research prospects. Within the broad scope of human geography there are still unanswered questions relative to the effect of ethnic minorities upon the cultural landscape. Definition of trade territories of the towns and cities and their practical application in the economics of transport will need constant revision as will analyses of population distribution and population shifts. A complete survey and appraisal of the natural and human resources and the associated development of integrated conservation policies is perhaps the most worthwhile project which could be carried out in New Zealand.

The above are but a few of the possibilities which ought to interest New Zealand scholars. But in this connection one of the most unfortunate aspects of contemporary New Zealand society is that stated by Michener: '. . . gifted young people tend to run away from their own land back to the security of England'. The problem of how to retain young people for productive effort in the dominion is serious, and certainly has no one simple solution.

Beyond generalisations about scenic beauty, pastoral economy, isolation, hospitality, and social legislation what Americans know about New Zealand is largely what New Zealanders have taken the pains to communicate to them. The logical first steps toward enlightenment must be taken by New Zealanders studying New Zealand. The growing number of geographers who have taken this step are to be complimented; and the *New Zealand Geographer*, which circulates their writings widely in the United States and elsewhere overseas, is performing for the people of New Zealand a very useful service.

PHOTOGEOGRAPHY

A PICTORIAL SURVEY OF NEW ZEALAND

10. RAROTONGA: PACIFIC OUTPOST

Photo: National Publicity Stud

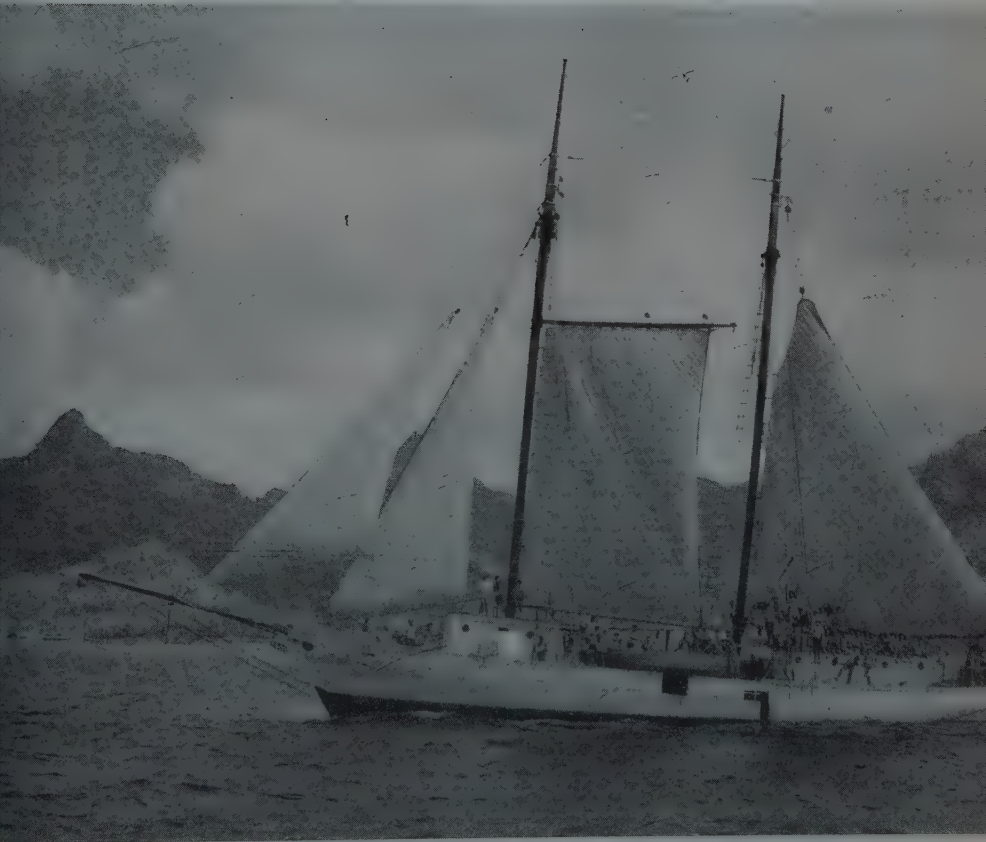

Fig. 1. *Copra cutters link Rarotonga with the scattered atolls of the Northern Cook Islands. In the background is the irregular profile of Rarotonga's high volcanic pile.*

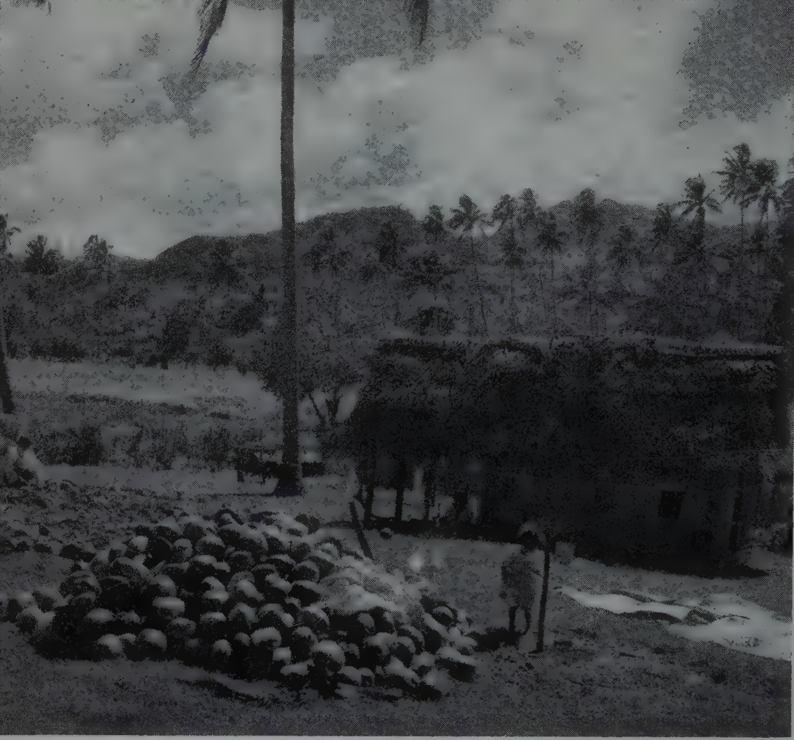

Fig. 2. *On Ra*
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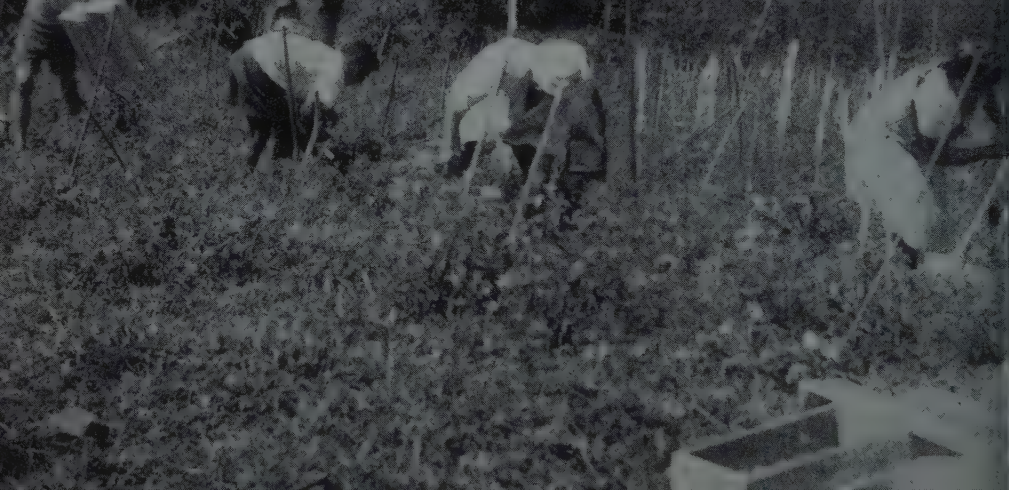
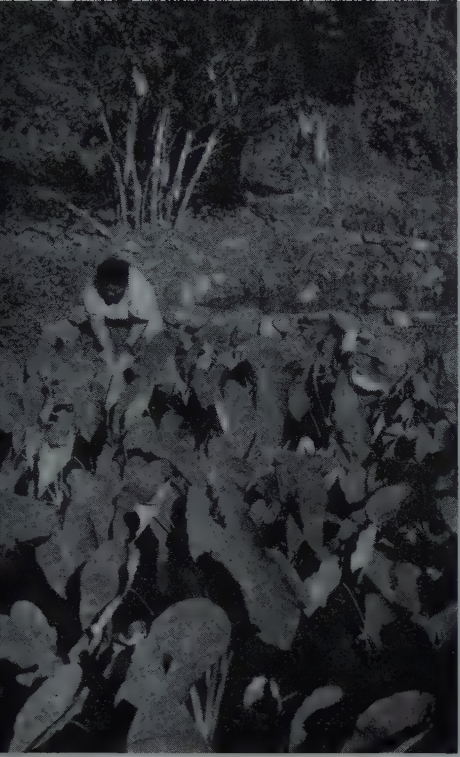
Photo: National
Publicity St

COCONUTS AND TOMATOES —

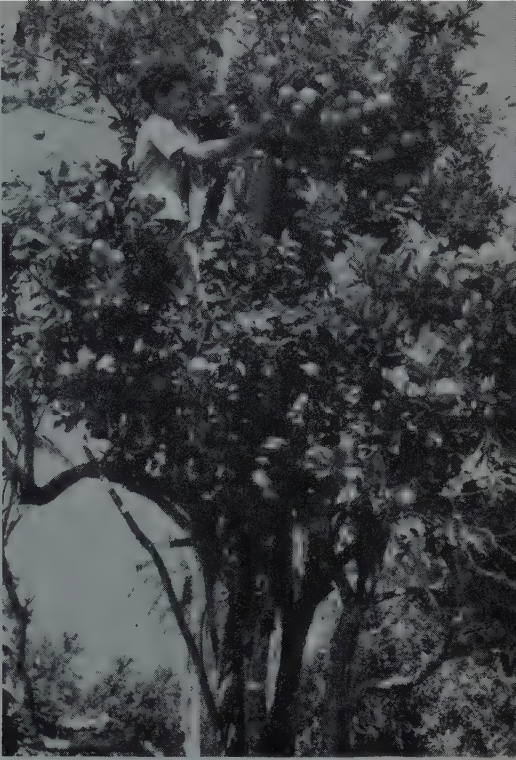
Fig. 3. *Tomatoes are a catch cash crop, planted in the hope that the* Maui Pomare *will arrive when they ripen. For two days before her arrival there is unaccustomed bustle and activity.*

Photo: Kenneth B. Cumberl





ig. 4. *Irrigated taro beds.*



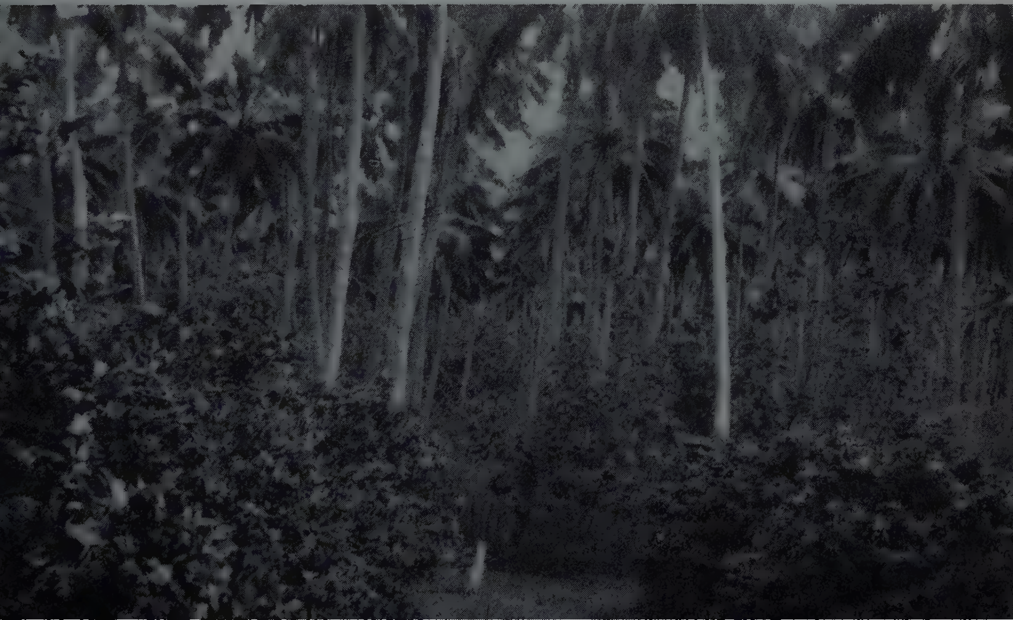
Photos: National Publicity Studio

Fig. 5. *Untended oranges in the bush.*

—— TARO AND ORANGES

g. 6. *Few European holdings remain in production. This produces copra and oranges or export.*

Photo: Kenneth B. Cumberlan



GEOGRAPHIC NOTEBOOK

CONTRIBUTORS TO THIS ISSUE. Amongst graduate students of geography seeking a topic or problem for investigation as a necessary part of postgraduate training, urban geography has hitherto proved to be the most popular choice, with a result that few New Zealand cities or towns of moderate to large size have not been the subject of geographical study. But few research workers have concerned themselves with the methodology of urban geography, and fewer with a critical examination of accepted concepts. It is for this reason that Mr. L. L. Pownall's comparative study of New Plymouth, Wanganui and Palmerston North is especially welcome. Mr. Pownall, who is Senior Lecturer in Geography at Canterbury University College, has already contributed to the *New Zealand Geographer* essays on Auckland and Feilding, and like them the present article is the outcome of part of a major project on the urban geography of New Zealand as a whole.

For her study in the historical geography of Otago, Miss Mary B. Kibblewhite, Demonstrator in Geography in the University of Otago, has chosen a most appropriate period. Her essay is a condensation of the thesis she presented in 1951 for the Degree of Master of Arts in Geography.

Mr. J. W. Hutchings of the New Zealand Meteorological Office, Wellington, and Mr. Ross Dick, Assistant Lecturer in Geography in the University of Otago, contribute to this issue more specialised studies in aspects of physical geography. Both Mr. Hutchings' detailed investigation of the history and nature of tropical cyclones in the southwest Pacific and Mr. Dick's cartographic representation of New Zealand vegetation according to a recently-devised physiognomic classification are valuable contributions towards the description and interpretation of the patterns of world climate and vegetation.

In this issue the new feature *Geography in Schools* is continued by Miss A. M. Gorrie, Lecturer in History and Social Studies at the Auckland Training College. Her objective scrutiny of the social studies syllabus in post-primary schools has persuaded her to make constructive suggestions for its improvement. Dr. Howard Critchfield, formerly Visiting Lecturer in Geography at Canterbury University College, is now at Western Washington College, Bellingham, Washington, U.S.A. and is particularly well-fitted to comment on recently-published American 'views' of New Zealand.

Regular readers of the *New Zealand Geographer* will notice the omission of *Branch Affairs* from this number. It has been decided to transfer this feature to the *Record* and so bring together in the one journal all information on branch activities. Meanwhile it has been possible to continue the series *Photogeography*, and on this occasion it features Rarotonga, the main island of the Cook group. (In studying the photographs reference should be made again to two recent articles: Kenneth B. Cumberland: 'New Zealand's "Pacific Island Neighbourhood" ', *New Zealand Geographer*, Vol. 5, No. 1, April 1949, pp. 1-18; and W. B. Johnston: 'The Citrus Industry of the Cook Islands', *ibid.*, Vol. 7, No. 2, October 1951, pp. 121-138.)

Notes, commentaries and reviews in this issue have been contributed by: Professor W. R. McGregor, Dr. W. R. Geddes and Mr. B. H. Farrell of Auckland University

College; Mr. F. H. Bishop of the Sacred Heart College, Auckland; Mr. H. G. Dorrington, Headmaster of the Thames High School; Mr. L. J. Wild of Otaki; Dr. R. A. Falla, Director of the Dominion Museum, Wellington; Mr. John Cox and Miss Ruth Coxhead of the Planning Division, Ministry of Works, Wellington; Mr. L. L. Pownall and Mr. M. McCaskill of Canterbury University College; Mr. A. H. Payne of the Dunedin Teachers' Training College; Mr. G. H. Lawton of the University of Adelaide; Mr. K. W. Robinson of the University of Sydney; Mrs. Joyce K. Bewley; and the editorial staff.

GEOGRAPHY AND PLANNING. Geographers and planners have much in common. Both have witnessed significant changes in the approach to their subjects in recent years, mainly from the point of view of emphasis. Man is no longer regarded as a passive creature circumscribed, even moulded by his physical environment, or dulled by his habits. He has emerged as an active agent who at will has fashioned, even transformed, his surroundings. Yet this is not to overlook the limitations that may be imposed by physical conditions in certain areas. Even so, it is the realisation of man's potentialities in relation to his environment that has made possible such great adventures as TVA and the transformation of the desert in Palestine. It is this much broader concept which has given geographers and planners the opportunity to make a contribution peculiarly their own.

They are not specialists in the same way as are geologists, pedologists or climatologists on the one hand, or engineers, architects, or economists on the other. But therein lies their value; for the shortage is not of experts in limited fields but of people who see the whole panorama, and who, by their training, are able to strike a balance amongst the contending specialties. The geographer and the planner both study a wide range of topics, both understand and can interpret specialist detail, but their real task is one of synthesis—of coordination and integration. In this field their training makes them expert.

Yet while the techniques of survey and study of geographers and planners are similar, their objectives are very different. The geographer describes and interprets the character of areas; he is concerned with what they are and how they differ the one from the other. The planner is more concerned with what they can be. He accepts the geographer's assessment of the area, and in the light of social standards, technological possibilities and political objectives, presents, first, a blueprint of the area as it should appear at the end of the planning period and, secondly, a programme of development by which this stage can be progressively achieved. It is a mistake, however, to regard the geographer's work as separate from that of the planner. Certainly the geographical study of the area as it is should be completed before the planner starts, but the geographer by his training and knowledge can make a valuable contribution to the problems that face the planners, particularly in a possible appraisal of the factors which are likely to influence the character of an area as a programme of planned development is implemented.

Planning in New Zealand, however, has hitherto been largely deprived of this assistance. Moreover, there has long been a shortage of qualified planners. Since the necessary preliminary work has not been completed planners have had perforce to undertake research themselves, even the compilation of base maps. Nevertheless considerable progress has been made with planning in this country. In the four main centres metropolitan plans are in various stages of preparation, whilst schemes for Hamilton and Palmerston North are under way. These last are of absorbing interest since the cities concerned are centres of rural regions the limits of which have yet to be defined and whose character in terms of industrialisation and the provision of social and educational amenities must be assessed against those of the metropolitan centres. In this way a balanced growth might be assured.

Problems arising from the encroachment of urban areas on good farmland must be solved, or anticipated, in areas such as the Poverty Bay flats, the Heretaunga Plain, the southern Manawatu and the Stoke Riding of Waimea County. In Ashburton County the effects of the development of irrigation must be foreseen and provided for, and further study may well modify premises already made. The development of the North Auckland Peninsula, with its expanses of scrub, its pockets of rich dairy-farming country and its rapidly expanding towns, calls for a completely integrated regional study, and a start has been made at Dargaville and Kaikohe.

Much remains to be done. Of this the planner is well aware, but until the essential background studies are completed he is forced from expediency to expediency. He must look to the geographer for a solution to this dilemma.—John Cox

COMMERCIAL AIR TRANSPORT. During the past year all phases of New Zealand commercial air transport, both internal and external, continued to show notable increases. The general information concerning these activities is set out in the *Annual Report* of the Air Department and in that of the National Airways Corporation, both of which were recently presented to the House of Representatives. Further relevant information of considerable interest was also published in the *Civil Aviation Journal,* No. 13, 1952.

One important development in the air transport industry of New Zealand which occurred during the year was the taking over of the operation of the Cook Strait Rail/Air Freight Service by a privately-owned company, Straits Air Freight Express Ltd. The state-owned National Airways Corporation, however, continued to operate its own passenger, freight and mail services over a network that was substantially the same as in the previous year. From the point of view of the taxpayer, perhaps the most interesting feature of the air services was that, for the year, the corporation's finances showed a net profit after showing a net loss for several years previously. Contributing to this satisfactory position, however, were several fortuitous circumstances, the prolonged shipping strike among them, which can hardly be regarded as normal.

All NAC operations increased substantially over those of the previous year. Fare-paying passengers carried increased from 238,405 to 303,048; freight from 2243 tons to 4858 tons; and mail from 916,688 lbs. to 1,782,084 lbs. Unfortunately, the omission of certain appendices in the annual report of the Air Department for this year makes it impossible to assess from the report on what parts of the country's air services these increases were most notable. Nevertheless, the figures given above reveal some very interesting features. The increase in mail carried was 94.4 percent; this was a far greater increase than in any preceding year and occurred when previous figures seemed to suggest that airmail had approached its maximum. The freight carried more than doubled the previous year's totals, but much of this increase must be attributed to the shipping strike. Because passenger traffic remains the principal source of the corporation's income, the increase of twenty-seven percent in the number of passengers is most significant. During the previous year the number of passengers carried amounted to an average of one in every eight of the population, thereby making New Zealand the second most airminded country in the world, after Australia, on this basis of computation. During the year 1951-1952 this figure improved to an average of one air passenger to every 6.6 of the population. On the Cook Strait Rail/Air Freight Service the amount of freight carried also showed a large increase in spite of several difficulties during the year. The actual increase was from 14,000 tons to 22,170 tons—a really outstanding total.

Recently the Department of Civil Aviation has made statistical analyses of the numbers and percentages of passengers travelling by air and sea between the North and South Islands and similar analyses have been made for overseas passenger traffic. Between the two islands during the last year the overall percentage of passengers who elected to travel by air increased from twenty-one to fifty-two percent over the previous year. In detail the increases were as follows: Wellington-Christchurch, from sixteen to twenty-five percent; Wellington-Blenheim, from twenty-eight to thirty-four percent; and Wellington-Nelson, from thirty-six to fifty-five percent. For overseas traffic during the year the proportions of passengers who travelled by air, compared with sea traffic, in the various directions were as follows: between New Zealand and Australia, 59.4 percent; and between New Zealand and North America, 64.5 percent.

Aerial work operations also showed great increases over the totals for the previous year. In aerial topdressing operations 199,066,780 lbs. of superphosphate were spread over 829,582 acres of hill country as against 100,402,391 lbs. over 428,737 acres in 1950-1951. The number of companies actually operating increased from twenty-two to thirty-three. Other types of aerial work showed similar increases. In aerial seed-sowing 206,024 lbs. of grass-seed were distributed over 30,113 acres, while 1,152,256 lbs. of phosphorised pollard for poisoning rabbits were spread during the year. The total weight of supplies dropped to deer-cullers and other material dropped from the air amounted to 231,807 lbs. of air cargo. In the above statistics the figures for aerial topdressing conceal an item of special interest. Taking the average plane load of superphosphate to be 350 lbs., the total weight distributed must have entailed over one million landings and take-offs. With this in mind, the low fatality rate in these operations is most notable. As far as actual flights for aerial topdressing were concerned there was only one fatality during the year—and this occurred as a result of an accident that happened as the pilot was coming in to land after the sixty-sixth and last trip of the day. The Aviation Industry Association, the official organisation of the aerial topdressing operators, has every reason to be proud of the efficient techniques it has developed.—F. H. BISHOP

POPULATION CHANGES 1945-1951: The interim returns of the census of New Zealand taken in April 1951 reveal a total population of 1,939,703 including 113,777 Maoris. Exclusive of members of the armed forces overseas this is an increase of 13.95 percent on the total for the previous census in September 1945. If armed forces serving overseas at the census dates are included (44,000 in 1945 and 1800 in 1951) the increase is 10.93 percent for the European and 13.8 percent for the Maori population. The numerical increase of 180,121 is the highest ever recorded between censuses although the average annual rate of increase, 1.88 percent, has been exceeded in the past. There was every expectation, then, that the population of the dominion would reach two millions before the end of 1952, and this figure was actually reached on the first of September.

TABLE I

POPULATION DATA: 1881-1951

Census Year	Percentage of Total Population		Percentage of Total Population	
	North Island	South Island	Counties	Cities and Boroughs
1881	39.3	60.7	59	40
1901	50.5	49.5	54	45.3
1921	60.8	39.2	43.5	55.9
1936*	64.7	35.3	43	56.7
1945*	67.3	32.7	39.6	60.2
1951*	67.7	32.3	38	61.9

*Including Maori population.

Study of the provisional results of the 1951 census (*Interim Returns of Population and Dwellings,* Wellington, 1951) shows significant trends in the distribution of population within the country and raises some challenging problems in their interpretation. Two trends which have long been apparent are the 'drift' of population from rural to urban areas and the relative decrease in the South Island population, commonly referred to as the 'drift to the north'. The interim returns for the 1951 census suggest, at first sight, a slackening in the rate of the urban movement, but this is an apparent trend only. Rural population in the census returns includes people living in the built-up areas of counties adjacent to, but beyond, the statutory limits of cities and boroughs. The spread of suburban development beyond city limits accounts for a large part of the numerical increase in the total county population in the past five years.

The settlement of assisted immigrants in the postwar period has not affected the relative distribution of the population of the two islands. Of 10,000 assisted immigrants sixty-eight percent have been settled in the North Island and thirty-two percent in the South Island. (See *Labour and Employment Gazette,* Vol. 2, No. 1, February 1952.) It is significant that seventy-six percent of these people have been settled in the six urban areas of Auckland, Hamilton, Hutt, Wellington, Christchurch and Dunedin where three-quarters of all notified employment vacancies are recorded. Most of the other assisted immigrants have gone to power construction projects in both islands, while about 500 have become farm workers.

Some interesting regional trends are apparent from the census returns. In contrast to the 1936-1945 period relatively few counties show a decrease in population. On the other hand few rural counties have increased at a rate approximating the New Zealand average increase of 13.9 percent. Populations in most of the long-settled and intensively-farmed areas have increased at the relatively slow rate of between five and ten percent. These areas include the Waikato, Taranaki and Manawatu lowlands, Marlborough, the Canterbury Plains, coastal Otago and Southland. The counties of central Northland and the Coromandel Peninsula show increases equivalent to the national average while the east coast of the North Island between Gisborne and Opotiki, southern Hawkes Bay and the Wairarapa show increases in rural population of between one and five percent. Central Hawkes Bay and the coastal belt of sparsely-settled country from Castlepoint to Cape Kidnappers have recorded increases of between fourteen and twenty-three percent.

Decreases in population are recorded from the far north of Northland, and from the counties of Kawhia, Whangamomona, Wairoa, Pahiatua, Manawatu and Waimate West. In the South Island the decreases in Kaikoura County (seven percent) and Malvern County (thirteen percent) are a reflection of the special circumstances which obtained at the 1945 census date. The railway construction camps near Kaikoura and the Burnham military camp had large temporary populations at that time. The only other South Island county to experience a net decrease was Maniototo in Central Otago.

Apart from counties adjacent to expanding urban centres the main area of high rural increase was in the central North Island and Bay of Plenty counties of Taumaranui (twenty percent), Taupo (136 percent), Rotorua (forty-three percent), Tauranga (thirty-one percent) and Whakatane (twenty-three percent). These impressive increases are associated with the power construction projects on the Waikato river, with major developments in both the indigenous and exotic timber industries, and with the steady expansion of land settlement. The high rate of growth for Taupo (and Matamata) County is due to the growth of new towns at Mangakino (and Tokoroa), neither of which has 'urban' status although performing urban functions. In the South Island high rates of increase in rural areas appear to be related to the development of industries other than farming. The hydroelectric projects at Cobb, Tekapo, Pukaki and Roxburgh have been responsible for high rates of population growth in the counties of Takaka (thirty-two percent), Mackenzie (twenty-seven percent) and Tuapeka (forty-eight percent). The only West Coast county to attain the New Zealand average rate of increase was Inangahua where there has been an expansion in coal mining and a revival of bush sawmilling. Had the 1951 census been taken a few months later, however, the almost complete abandonment of the quartz-mining township of Waiuta after the closing down of the Blackwater mine in July would have been reflected in the loss of more than 300 people from Inangahua County. The increase of thirty-four percent in Waimea County may be partly accounted for by the suburban 'overflow' from Nelson and partly by the temporary influx of hop and fruit pickers, whilst the two-thirds increase in Stewart Island can be attributed mainly to the influx of temporary visitors for the mutton-bird season.

The relative rates of growth of the fifteen urban areas of New Zealand show some interesting differences. As in the previous intercensal period Hutt again shows the highest rate of increase while Wellington replaced Dunedin in having the smalles percentage increase. The Hutt urban area now has some 75,000 people, only 20,000 less than Dunedin. Nelson is second on the list for New Zealand in its rate of growth and is the most rapidly growing urban centre in the South Island. Four urban areas Napier, Wanganui, Wellington and Dunedin recorded rates of increase below the New Zealand average Auckland again shows the highest numerical increase (42,000) but has not maintained the twenty-five percent rate of increase that made it the second most rapidly expanding centre in the period 1936-1945. Seven of the smaller provincial cities have surpassed Auckland in their rate of growth. The fairly high rates of increase recorded by New Plymouth (eighteen percent), Gisborne (sixteen percent) and Invercargill (fourteen percent) contrast with the relatively sluggish growth of these remoter centres in the 1936-1945 period. Two centres, Wanganui and Dunedin, have shown renewed lease of life. Between 1926 and 1945 the population of the Dunedin urban area decreased by one percent. The renewed growth, suggested by a nine percent increase, points to a brighter future for Dunedin, especially when power from the Clutha River becomes fully available a decade from now.

The relative increases in the smaller towns of New Zealand differ markedly, and in many cases there seems to be little relation between the growth of a town and the population trends in the adjacent countryside. Thus, the population of Kaitaia in the far north of Northland increased by forty-nine percent whereas in adjacent counties there was no net increase. Although the rural population of the Waikato is increasing the towns are growing much more rapidly; by contrast Rotorua County increased more rapidly (forty-three percent) than the borough of Rotorua (thirty percent). On the west coast of the South Island urban and rural rates of growth are approximately equal with the exception of that of Westport where the borough has increased by seventeen percent at the expense of the smaller coal-mining villages.

In two areas of New Zealand there is a remarkably consistent rate of growth in the towns. The six towns in the northern part of the South Island are increasing at a much faster rate than the dominion average, whilst in the Auckland Province north of a line including Taumaranui, Taupo and Opotiki the populations of most towns and cities are increasing by seventeen percent or more. The only exceptions are Thames, Waihi, Te Aroha and Pukekohe. This northern area includes the towns showing the highest rates of increase in New Zealand. Mount Maunganui for the second intercensal period had the greatest increase (eighty-nine percent), and was closely followed by Taupo (eighty-seven percent) and Putaruru (eighty percent).

The results of the previous census in 1945 suggested trends which gave justifiable cause for alarm—the widespread decrease in rural population, the abandonment of much marginal land, the marked disparity in the relative growth of different urban centres and of the North and South Islands. An authoritative analysis of New Zealand's postwar population trends must await publication of the detailed returns in the final census report. Meanwhile one is tempted to suggest that these trends are much less disturbing than those apparent in the previous ten years.

—MURRAY MCCASKILL

THE SOUTH PACIFIC COMMISSION. The South Pacific Commission was established by an agreement signed at Canberra on 6 February 1947 between the governments of Australia, France, the Netherlands, the United Kingdom, the United States and New Zealand. Its purpose was to aid these governments to coordinate and develop programmes for the social and economic advancement of the island peoples under their jurisdiction. At first the scope of the commission was limited to those territories lying wholly or in part south of the equator and east of, and including, Netherlands New Guinea. On 7 November 1951 the area was extended to include the Micronesian Trust Territories of the United States and Guam. Tonga, a self-governing territory, was not included in the area but the Government of Tonga has sent representatives to meetings of the commission, the headquarters of which are at Noumea in New Caledonia. Funds are derived almost wholly from the participating governments, the contributions in 1952 being approximately £A50,000 from Australia and between £A21,000 and £A25,000 from each of the other governments.

The commission is authoritative only in the quality of its advice to the cooperating governments. These retain full right to control their own policies, although they are pledged to try to unify them as far as possible through the good offices of the commission. The South Pacific Commission is, therefore, a cross between an intergovernmental *marae* and an information bureau with its own staff of experts, and in furthering research it prefers to work through existing institutions which it may aid with grants.

The extent of the commission's activities may be judged from its latest *Quarterly Bulletin* (Vol. 2, No. 3, July 1952). Projects in hand include, in the field of public health, those dealing with filariasis and elephantiasis, tuberculosis and child nutrition; in the economic field, the encouragement of the cultivation of cash crops, the control of pests, diseases and weeds, the introduction and distribution of economic plants, the development of fisheries, and the improvement of tropical pastures and stock; and, in the field of social activities, the vocational training of island peoples, the use of visual aids in child and adult education, mass literacy and community development. So wide are the ramifications of these projects that it is impossible to give details, but many of them involve basic research bound to yield results of great value. A biochemist has been employed at the Australian Institute of Anatomy on an analysis of the nutritive value and palatability of the coconut in various forms; two experts have been appointed to carry out an investigation of coconut, coffee, tea and copra production; the commission nutritionist has been making a detailed study of the diet of infants; and a correlation is being made of information of land utilisation arising from land-use surveys carried out by the administrations of the various territories.

Without any qualifications at all it may be said that much of the commission's work will prove of inestimable worth. But to an anthropologist it is a matter for regret that the commission's experts do not yet include a permanent anthropologist, although there is much consolation in the fact that the Executive Officer for Social Development, Mr. H. E. Maude, O.B.E., is qualified and experienced in this field.

This lack may prove a genuine source of weakness in the commission's work. The problem will be to translate the excellent broad programmes for social and economic development into terms acceptable to the people. This will often mean detailed knowledge of the attitudes and institutions of the particular native society concerned —information which is not always accurately collected or interpreted by government officials unable to make it their primary concern. Yet such information is vital to many projects. For instance, Professor J. P. Thijsse, a Netherlands expert who was engaged by the commission to study housing problems within its area, says in his interim report: 'Efficient housing in the islands involves consideration, not only of climate but also of social, economic and hygienic factors and these vary markedly between the island groups'. Actually the commission has planned two particular anthropological investigations; one a study of the islander in commerce and in industry directed by Dr. W. E. H. Stanner of the Australian National University, and the other a study of population probably to be carried out by Netherlands anthropologists. But what may be needed as well is a permanent anthropological officer available for consultation whenever and wherever he is needed. Other institutions similar in nature to the commission, such as the Colonial Social Science Research Council, recognise the contributions to their work which anthropology may give.

Nevertheless the work of the South Pacific Commission is characterised by cooperative effort, and though much remains to be done, a great deal has been achieved. The publications of the commission are sufficient evidence of this, and their value is enhanced by the inclusion of extensive bibliographies. To all interested in the territories under the aegis of the commission they are indispensable reading.

—W. R. Geddes

GEOGRAPHERS IN AUSTRALIA. There are now two chairs of geography in Australia, one held by Professor Macdonald Holmes at the University of Sydney and the other, the newly-established chair in the School of Pacific Studies at the Australian National University at Canberra held by Professor O. H. K. Spate. At present there are three senior students doing research work for a higher degree under the direction of Professor Spate, and it is to be hoped that graduates from departments of geography in the different states will find it possible to do postgraduate research at the National ~~University in the future.~~

Three appointments to senior positions in university departments of geography in the last two years indicate the recognition that has at last been given to the subject. Mr. R. H. Greenwood came from the University of Otago in New Zealand to take charge of a new department at the University of Queensland, and already he has introduced plans for a three-year course in geography in the Faculty of Arts. Mr. A. D. Tweedie has recently been appointed Lecturer in Geography to assist Mr. Greenwood.

Mr. G. H. Lawton, who was formerly Associate Professor of Geography at the University of Washington and Senior Lecturer in Geography at Canterbury University College, was appointed Reader in Geography at the University of Adelaide in August last year. In addition to three stages of geography for a bachelor's degree, economic geography is given as a special course for students in the Faculty of Economics, and an honours course in geography in the Faculty of Arts is to be introduced for the first time in 1953. Other members of the teaching staff are three part-time lecturers, Mr. F. C. Martin, Mrs. T. J. Marshall and Dr. Grenfell Price.

Mr. Peter Scott from South Africa has accepted the position of Lecturer-in-Charge of the Department of Geography at the University of Tasmania in Hobart, and he is expected to take up his appointment within the next few months.

There have been relatively few changes in the departments at the Universities of

Sydney, Melbourne and Western Australia in the last few years. At the University of Sydney, Professor Macdonald Holmes is assisted by Mr. W. D. Mackenzie, Mr. K. W Robinson, Mr. P. J. Devery and Mr. D. S. Simonett. Dr. John Andrews is still on leave from the department and has an appointment with the United Nations Organisation in New York. Mr. Ellis Thorpe is in charge of the Department of Geography at New England University College, Armidale and Mr. A. J. Rose, a graduate of Canterbury University College, Christchurch, has recently been appointed Lecturer in the same department.

At the University of Melbourne a first-year course in geography is under the direction of Mr. A. A. Wilcock, who is at present on leave overseas, and two stages in economic geography form part of the syllabus in the School of Commerce under the direction of Dr. G. L. Wood, Miss Molly Bayne, and Mr. D. W. Fryer, who has recently come from the University of Malaya at Singapore. In Western Australia, Dr. J. Gentilli, who is also on leave overseas at present, is in charge of a two-year course in physical and economic geography in the Department of Economics.

Now that new departments have been set up within the Universities in Australia not only will more geography be taught to more students, but it is hoped that more research work will be carried out over a wider area in the very near future.

—G. H. LAWTON

GEOGRAPHY AT A.N.Z.A.A.S. The 1952 meeting of the Australian and New Zealand Association for the Advancement of Science was held in Sydney in August. The number of people who enrolled and attended the meetings of the Geography Section was greater than for previous meetings, reflecting in particular the development of departments of geography in university centres other than Sydney. In addition to the universities, various government departments and the teaching profession were well represented.

The session was chaired by Mr. Grenfell Ruddock, Director of Regional Development, Canberra, who delivered a presidential address, 'Geography and National Development'. It is encouraging to know that a responsible person without geographical training has a real appreciation of the value of geography in national affairs. The meetings were, in their order on the programme: Field Studies in Geographic Regionalism; Problems of the Southwest Pacific; The Field of Historical Geography; Geography in Australian and New Zealand Universities; The Future of Northern Australia; Land Use Studies; Population Studies; Climatic Studies; Oceanography and Antarctica. Papers were presented by twenty contributors.

Contrasts between Australia and New Zealand were illustrated by the two regional papers: 'Southland-East Otago' by Mr. A. D. Tweedie and 'The Tweed Valley, New South Wales' by Mr. P. J. Devery. The papers also demonstrated two entirely different methods of approach. Mr. D. W. Fryer provided an up-to-date account of food production in Malaya, while Professor O. H. K. Spate supplied a lively commentary on 'Changing Native Agriculture in New Guinea'. He was heard again in a vigorous attack on the 'reconstruction school' of historical geography, whose interpretation of past geography is allegedly usually no more than economic geography in the past tense. Other papers in this section were on population and settlement in the

Sydney district in the first years of establishment, the settlement of Darwin's hinterland, and the development of Northern Australia. A discussion on 'The Future of Northern Australia' was held at a public meeting attended by the Governor-General of Australia, Sir William McKell, and proved a highly successful means of pooling the views of pastoralists, administrators, academicians and others on the many problems facing Australia's north.

In another session the methods of regional land survey employed by the C.S.I.R.O. in Northern Australia were outlined, while other papers discussed sugar and settlement in north Queensland, the Australian wheat industry during the last fifty years, the changing landscape in the mallee areas of South Australia and pastoral development on Kangaroo Island. The last two papers underlined the importance of superphosphate, subterranean clover and trace elements in reclaiming the 'desert'. Climate (as is usual and necessary in Australia) came in for its share of the programme. Technical papers were given on 'Rains in relation to Pressure Patterns in the Upper Atmosphere', 'The probability of Drought Risk in New South Wales' and 'Trends in Climatic Studies'. Mrs. T. J. Marshall made a spirited plea for less 'rationalisation' in her constructively critical paper 'The Purpose of Climatic Classification'.

There was a general impression that the conference was well worthwhile, though it was regrettable that there were no direct representatives from New Zealand. On the other hand of the twenty contributors, it is not without interest to note, five were either trained or had taught for some years in the colleges of the University of New Zealand. Geography in Australia has at last reached the stage where selection has become necessary in the making-up of programmes, so that less time is given to papers and more to discussion and to meeting people as well as hearing them lecture. In stressing this, the 1952 conference stressed also the rapid advances that geography had made in both Australia and New Zealand in recent years.—K. W. Robinson

IN OUR CONTEMPORARIES

1. *In New Zealand Journals . . .*

Town and Country

THE URBAN DRIFT: G. M. Miller, *Economic Bulletin No. 328,* Canterbury Chamber of Commerce, April 1952.

The drift of population in New Zealand from rural to urban areas has been a striking feature of the last seventy years. Possible causes and implications of this movement have frequently been advanced in the past by commentators from many sections of the community, most of whom have seen in this drift undesirable economic and social repercussions. The most recent of these commentaries brings an economist's viewpoint once again to bear on this topic.

As Mr. Miller points out, over the last seventy years, and particularly under the impact of motor transport, the New Zealand farm has become less self-contained and the farmer now looks increasingly to the towns for the provision of goods and services which he once made or carried out for himself. Some urban workers in this way may be considered as partial farm workers while many urban dwellers in the smaller towns are seasonal or full-time agricultural workers.

It is also demonstrated clearly that there has been a decline in the rural labour force in New Zealand and yet at the same time farm production has expanded. This expansion has been achieved by an increased capitalisation on machinery and by improved methods of farming. The immediate economic danger from this urban drift does not appear therefore to lie in a decline in primary production in New Zealand nor do statistics relating to the placement of assisted immigrants suggest that the demands for labour from the farmers are as impelling as those from urban businesses. And yet the standard of living of every individual in New Zealand must in the long view be determined by the value of the primary produce raised by New Zealand farmers and sold overseas. As the writer of this interesting article points out, the important consideration is to ensure that labour and capital are being invested between the farms and the other sections of the national economy so that the maximum benefit from their investment is obtained.—L. L. Pownall

South Canterbury Landscapes

FARMING IN NEW ZEALAND; LEVELS COUNTY: R. C. Scholfield, *New Zealand Journal of Agriculture,* Vol. 84, No. 6, June 1952, pp. 447-460.

Levels County is one of the smaller counties in the South Island and in any general survey its agriculture is described as being of the mixed farming type. In this article Mr. Scholfield reveals the wide variations in farming practices, from the more intensive dairy farms on the gley soils near the coast, through the typically mixed farming of the downlands, to the more extensive forms of sheep and cattle grazing on the hillier areas in the west of the county.

A brief agricultural history is given and surface configuration, climate and soils are described. The changing soil types reflect to a high degree the nature of the land surface, the division into flat coastal country, downlands, and strongly rolling to steep country forming the basis not only for a differentiation of the various soils but also for a description of farm-management types. Written primarily for the interest of the farming community, the description of soils is pleasingly devoid of technical terms and the soils are described throughout, not only in connection with their drainage and fertility properties but also in relation to their cropping potentialities. Crops themselves are discussed separately, and the conditions which affect production are emphasised. Crop rotations are an important feature of mixed farming in Levels County, and these together with the use of short-term pastures, lime and fertilisers are recognised as being of extreme importance in the maintenance of soil fertility.

Each of the farm-management types of mixed cropping (itself divided into three types, irrigated, non-irrigated and downland), sheep and cattle grazing, and dairy farming is described and is illustrated by a clear land-use map, a more detailed description being given of an apparently better-managed farm in each type. Mention, too, is made of developmental possibilities: 'Irrigation can be employed to a greater extent, more use can be made of subterranean clover in some areas, and on portions of the more difficult hill country some modification of the present practice of raising store sheep and some fat lambs is likely.'

Perhaps of most significance, not only to Levels County but also to much of the foothills area of South Canterbury, is the development of the store-sheep country. The detailed description of plans for converting a store-sheep farm to a fat-lamb farm typify the method of development for much of the area. Browntop is to be ploughed in, gorse rooted out, and when pastures are sown lime is to be applied. With higher soil fertility and better pastures, carrying capacities will rise, more fodder and cash crops will be grown, and lamb fattening instead of store-sheep farming will become possible.—R. Coxhead

2. *In Overseas Journals . . .*

An Urban Problem

TRAVELLING TIME TO WORK: SOME NOTES FROM THE NEW ZEALAND CENSUS OF 1945: John E. Watson, *Social Forces,* Vol. 30, No. 3, March 1952, pp. 283-292.

In this article Mr. Watson has analysed the census information of 1945 relating to the length of time taken in travelling to work by the working population. This study breaks completely new ground in New Zealand as a published statement and is to be welcomed on this account. It describes briefly the variations in length of travelling time for workers in urban areas, in provincial districts, and in different occupations.

This information is presented chiefly in six statistical tables and four maps. In the accompanying text the writer draws attention to the evidence supporting the assumption 'that the time spent in travelling to work is a function of the size of the urban area'. As an extremely broad generalisation this is probably correct but it does not help in the appreciation of individual cases. The fact that in the Auckland urban area 24.4 percent of the total male working population take more than thirty minutes to proceed to work while in Wellington only 18.4 percent require a corresponding time is not a function of either size of population or of urban area but is largely a reflection of the pattern of the urban areas themselves and of the transport links which interconnect the different parts of each. That a considerably higher percentage of Wellington's workers do not take longer is due in large part to the frequent and rapid suburban and interurban railway services which play a role of much greater significance in the capital city than in Auckland.

Marked variations in travelling time from what might otherwise be expected have been revealed by this survey, as for example, the case of Napier, but this cannot be explained by an inflow of commuters from Hastings, for rather the reverse situation prevailed between these two cities at the time of the 1945 census. A research student would find much to employ him in seeking answers to these anomalies.

The usefulness of data grouped by provincial districts has long been questioned by geographers in New Zealand and the effectiveness of the present statistics when grouped in this way by the census is almost completely nullified. That more conclusions have not been reached by the author is understandable. Further work along this line would seem to be academically profitable particularly if correlations could be made with other studies on the location of industry and commerce within the main urban areas.—L. L. Pownall

Phosphate Island

RECENT CULTURAL CHANGES ON THE ISLAND OF NAURU:

Graham H. Lawton, *Journal of Geography,* Vol. 50, No. 1, January 1951, pp. 12-20.

This article serves a dual purpose. On the one hand it outlines the particular problems, political, social, economic and educational, which face the Nauruans today. On the other it 'provides an interesting illustration of an important geographic concept; that the significance of the physical conditions of the land depends on the culture, or way of living, of the inhabitants. . . . To the indigenous natives most of this island is a barren wasteland. . . . To the European the central part of the island is a source of great wealth, the phosphate rock which is mined for export overseas'.

Mining the phosphate attracted Europeans to the island and resulted in far-reaching changes to the native economy. It has been predicted that this valuable raw material may be expended in seventy years. What then will happen to the Europeanised Nauruans is a moot point. 'We have brought them new ideas; it may be necessary now to think about providing them with a new land.'

Nauru is approximately nine square miles in area, and is encircled by a coral reef. On the landward side of the reef is a sandy beach backed by a narrow fertile belt up to three hundred yards wide. It is on this coastal strip that the Nauruans live and grow their coconuts and pandanus. Coconuts, pandanus, fish and the tamano wood from the interior plateau supplied all the needs of the natives before their simple culture was disrupted.

Mr. Lawton in this article traces the history of the island from its discovery in 1798 to the present day and the changes in the native economy which came mainly with the working of the phosphate from 1906. Nauru, which was part of the Marshall Islands protectorate under German administration from 1888, became a C class mandate under the League of Nations in 1919, 'and as such the resources of the island were not to be exploited but developed for, and with the help of, the Nauruans'.

As in Malaya the indigenous people were not attracted to mining so Chinese were recruited from Hong Kong for this purpose. Royalties received from the British Phosphate Commission and money earned as wages enabled the Nauruans to purchase European food, clothing and other commodities. They became less and less inclined to climb for coconuts or to set traps for fish, and meanwhile new buildings had appeared and part of the interior plateau had changed as the removal of phosphatic rock exposed the underlying coral pinnacles. The Nauruans began to live in a new world in the interwar years.

Nauru claimed the attention of Germany and then Japan in the Second World War, and Nauruans, who numbered 1848 at the time of the Japanese occupation were reduced to 1278 by the time of liberation. Material losses were heavy too. The post-war reconstruction programme gave employment to many Nauruans and this, together with increased royalties and the destruction of many coconut trees, led to an increasing demand for European commodities.

So has the old order changed, and of the total population of 3162 in 1948 there were 1370 Chinese, 247 Europeans, 97 other Pacific Islanders and 1448 Nauruans. Such a large group of Chinese must surely have given rise to social and economic problems, but there is no mention of them here.—JOYCE K. BEWLEY

FRANCE IN THE ANTIPODES

AKAROA: H. Jacquier, *Bulletin de la Société des Etudes Océaniennes,* Vol. VII, September 1951, pp. 247-259.

Nostalgia is evoked in many ways—the chance dialectal word, a particular scent, or, more probably, the glimpse of a landscape which could be 'home'. It seems only natural that Englishmen or Scotsmen should often discover in New Zealand these echoes of the past, for the countryside has been fashioned in traditional ways by people who have retained something of their old way of life. That a Frenchman, too, can undergo a similar experience may appear a little strange—at any rate it is a blow to the average New Zealander's rugged insularity. Yet M. Jacquier, wandering down a street named Lavaud and noting houses with windows set in mansard roofs and gardens gay with flowers, felt himself again in some village of the Charente Valley.

Today Akaroa has lost many of its original traits; it is a part of New Zealand. Nevertheless it will remain always a symbol of courageous enterprise, no matter how hotly the validity of British and French claims may be disputed by historians. M. Jacquier even now cannot divest himself of partiality as he describes how the *Britomart* stole a march on the corvette *L'Aube* by slipping away from the Bay of Islands amid the festivities of a June night in 1840. And with typical Gallic cynicism he ascribes the French failure—apochryphally, it is true—to the wiles of a pretty woman.

The story of the trials and struggles of the colonists who arrived shortly afterwards in the *Comte de Paris* is briefly told, but sufficiently to picture the wretchedness of people cut off from home in an alien land that had little to offer in the way of material riches. The forested slopes, the lack of grain, the dearth of stock, and the severity of the winters came hard to those sixty peasants from the smiling countryside of the Seuil de Poitou. Yet by 1848, when the problem of the '*status quo* at Akaroa' was finally resolved, the French were content to remain and to refuse an offer of land in the North Island. A few were repatriated, but most stayed to cultivate their plots of land and to watch, from apart, the burgeoning of the Canterbury settlement.

Akaroa is still distinct. French names linger, despite their anglicised pronunciation; the landscape, though essentially a part of New Zealand, possesses in a subtle way a character reminiscent of another land; and relics of early settlement persist—a table made by a ship's carpenter, a flag, a map, and daguerreotypes, but above all an old church and cemetery where memorials engraven with names like le Buffe, Pigoulet and Lelievre bear mute witness to French purpose and tenacity. There indeed is a tiny portion of *la France outremer.*

In short, it might appear that M. Jacquier's article does little more than recount an interesting history and the nostalgic impressions of a brief visit. But it does more. It suggests to the geographer that here is a field of study hitherto neglected. Frenchmen, Danes, Dalmatians, Bohemians and others have all contributed in their peculiar way to the individuality of landscapes in New Zealand. The significance of these contributions awaits interpretation.

Land from the Sea

AHURIRI LAGOON, NEW ZEALAND; A STUDY OF LANDSCAPE CHANGE AND RECLAMATION: Bryan H. Farrell, *Economic Geography,* Vol. 28, No. 2, April 1952, pp. 160-170.

The Hawkes Bay earthquake of 1931 turned about 8000 acres of the Ahuriri Lagoon into prospective farming land by elevating the whole area about five feet. In his short paper Mr. Farrell has given a most interesting account, well illustrated with maps and photographs, of the transformation of the landscape from a shallow lagoon into a large farming estate carrying over 11,000 sheep and with nearly 300 acres in crops. He has prefaced this with a statement on the physical background, and contrasts the present landscapes of the newly-developed area with those of the Heretaunga Plain and the interior hill country.

In developing the Ahuriri Lagoon Farm, the Department of Lands and Survey has faced problems unique in the history of farming in New Zealand. Mr. Farrell's paper will, therefore, have special appeal for those interested in the possible reclamation of coastal areas in other parts of the country. Emphasis is given to the major problem of excessive soil salinity, so that a lengthy period of investigation and experimentation has been necessary before land utilisation can be adapted to the prevailing edaphic conditions. In his conclusion the author makes the point that only the government has the necessary resources of capital, equipment and expert knowledge for this kind of work, and suggests that more intensive settlement might be premature at this stage. Readers will note the significance of the fact that, after nearly twenty years of planned development, there is still need for intensive research to determine the suitability of the land for various forms of agricultural occupance.—J. H. Martin

REVIEWS

Exploration and Discovery in the Southwest

PRELIMINARY REPORTS OF THE NEW ZEALAND-AMERICAN FIORDLAND EXPEDITION. By A. L. Poole. Wellington: Department of Scientific and Industrial Research, 1951, pp. 99.

Since several years may elapse before the complete scientific results of the New Zealand-American Fiordland Expedition of 1949 are available, it seemed desirable in the meantime to present 'brief accounts from all parties invited to take part in the expedition'. The result is a well-printed and attractively-illustrated bulletin outlining the work of an expedition compared with which probably no other that has worked on the mainland of New Zealand has been so thoroughly organised or so elaborately equipped. To read of a supply ship 'chartered to run approximately fortnightly trips from Bluff to Milford to the two beachheads at Caswell and George Sounds', of twelve-foot prams fitted with outboard motors which 'took stores and equipment five miles up the Stillwater River', and of a 'base camp established to hold a total of thirty-five people' which 'also had laboratory, cookhouse, wireless and storage tents and electric light generated by a 400-watt 12-volt lighting plant' is certainly calculated to evoke envious feelings in the explorers of a former generation who carried their swags or depended upon the limited abilities of a pack-horse or two.

The area chosen for study was the main breeding ground of the wapiti, approximately that portion of southwestern Otago that lies between Lake Te Anau and the west coast and between George Sound to the north and Caswell Sound to the south, a region which, on account of its relative inaccessibility and the ruggedness of the terrain, confronts the explorer with peculiar difficulties.

The principal purpose of the expedition was the comparative study of wapiti in New Zealand and America. Red deer of mixed stock were liberated in Fiordland on several occasions between 1900 and 1909 while wapiti were introduced at George Sound in 1905. Very appropriately, the investigation of the deer population of Fiordland was assigned to Dr. Olaus J. Murie, Director of the American Wilderness Society and scientific leader of the expedition. In a series of brief papers which comprise the first section of the bulletin, Dr. Murie outlines some of his observations and interim conclusions.

Dr. Murie defines the known range of wapiti in Fiordland and points out that although these animals have never been reported to be numerous in any one place, 'they have managed to occupy in limited numbers a considerable portion of Fiordland'. Like red deer, however, they are not uniformly distributed 'but are somewhat localised in favourable places' where suitable food abounds and the terrain is not too difficult. He comments upon the manifest impossibility of making an accurate count of any game animal in country of this broken and bush-clad character, but after the consideration of evidence derived from all available sources he states his impression 'that there are not over 500 wapiti in Fiordland and the number may be less'. He concludes that 'red deer are found in the wapiti ranges, and may greatly outnumber the wapiti'.

The successful establishment of wapiti in this country and their survival for forty-five years postulates a considerable degree of adaptability on the part of these animals. Their principal difficulty seems to derive from the precipitous nature of the country which 'itself is a mortality factor that may be unique and, together with disease, is probably important enough to prevent a normal increase in the wapiti herds'. However, not only did the breeding season shift from the September-October period of America to the New Zealand autumn, but 'the wapiti promptly established a food-habits pattern quite comparable with their original one in America, though with an entirely new flora'. Dr. Murie gives interesting details of the different kinds of food plants and of the feeding habits of deer in America while, within the brief space of two and a half pages, A. L. Poole and J. T. Holloway present a most strikingly detailed picture of the species of New Zealand plants that have been accepted instead, of the resultant changes in the composition of the indigenous flora, and of how in consequence 'a change from the natural vegetation to a new vegetation, still composed of native species, but more stable in the face of animal browsing and grazing, is in progress'.

It is clearly recognised that the Fiordland, being a national park, is primarily for the preservation of the flora and fauna in a natural state and that 'one of the threats to this primary purpose would be overbrowsing by red deer and wapiti to the point of altering the character of the forest. Assuming that red deer are either exterminated or reduced substantially in number, Dr. Murie, with the concurrence of his colleagues, expresses the opinion that 'the presence of a moderate wapiti population need not be a serious threat to the Fiordland forest'. On this point, however, the considerable number of New Zealanders who have learned at last to appreciate the peculiar flora and fauna indigenous to this country, and who are all too painfully aware of the ravages wrought by deer in other parts of New Zealand, will require substantial reassurance.

The remainder of the bulletin features eleven short reports by different authors on miscellaneous topics. 'The Geology of the Caswell and George Sounds Area' by D. Brown, 'Forest Survey' by J. T. Holloway, and 'Observation on Birds' by P. C. Bull and R. A. Falla are all well-balanced and informative accounts. 'The Vegetation of the Expedition Area' by A. L. Poole, R. Mason, W. R. B. Oliver and V. D. Zotov deserves a word of special commendation. It is a most comprehensive and useful description of the flora of Fiordland, compressed, together with photographs, into less than seven pages. Though brief, it is certainly not obscure but rather a distinct masterpiece of its kind.—W. R. McGregor

Manawatu Settlement

OTAKI: THE TOWN AND DISTRICT. By Francis Selwyn Simcox. Wellington: A. H. and A. W. Reed, 1952, pp. 172.

Messrs. A. H and A. W. Reed are rendering a useful service to the dominion by encouraging the publication of books such as this, books which give permanent form to otherwise inaccessible records and to the reminiscences of pioneers of which too many have already gone beyond recall. One is therefore not inclined to criticise unduly the type and production further than to remark that there is the occasional misprint (for example, consignees for consignors in the seventh line on page 163), and to say that the maps, while showing all necessary place names, are unattractive in design and printing. The illustrations are interesting and appropriate, and specially to be noted are four hitherto unpublished sketches from Kapiti by William Swainson, unfortunately undated. The index proves adequate.

A more serious criticism is that the arrangement of the material in chapters should have been more carefully edited. Chapter 13 is entitled 'Growth of the Settlement', Chapter 17, 'The Settlement Grows'. There is a chapter on local industries, but market gardening, nearly a page in length, is included with the Horticultural Society, whilst the Power Board and the Catchment Board appear in the chapter 'Amenities and Fairs'. The chapter headed 'Cultural Activities' begins with the Bank of Australasia and includes creameries, the fire brigade, the cordial factory and the cemetery, together with musical and dramatic societies, the brass band and the glee club.

But congratulations and thanks must be extended to the author—'the compiler', as he modestly calls himself. Few would have brought to a self-imposed task such industry and resourcefulness; only Mr. Simcox could have brought the wealth of information about persons and places and the access to family diaries that alone made it possible to produce this book. Mention should also be made of his critical consideration of some Maori place names, for instance, on pp. 129-130.

There is a chapter on the geological history of the Horowhenua Plain, mainly contributed by G. L. Adkin, but serious students will normally seek elsewhere information on this topic. The author is concerned mainly with records and descriptions collected as the material of history. He enters with zest into amusing stories of Maori race meetings and of Bill Jenkins, a celebrity of early days who knew that 'sarpint Robuller'; he gathers data about wrecks on the coast. Yet the geographer will find much of value. He may discover, for instance, why the main Otaki settlement developed where it did rather than at Otaki Railway or on the coast. There is much factual material about the flax and the timber industries, even about wheat growing and flour milling. Within the limits imposed by the author on himself the book is a valuable document for the student and an entertaining book for the general reader.

—L. J. Wild

Tourists' Vademecum

THE MILFORD COUNTRY. By N. S. Seaward. Christchurch: The Pegasus Press, 1950, pp. 48.

STEWART ISLAND. By N. S. Seaward. Christchurch: The Pegasus Press, 1951, pp. 38.

THE SOUTHERN ALPS: Part 1. By John Pascoe. Christchurch: The Pegasus Press, 1951, pp. 96.

CENTRAL OTAGO. By J. D. S. Roberts. Christchurch: The Pegasus Press, 1951, pp. 40.

RIFLE SPORT IN THE SOUTH ISLAND. By R. J. Francis Smith. Christchurch: The Pegasus Press, n.d., pp. 79.

It is refreshing, at a time when New Zealand's awareness of her great tourist potential appears tempered by disinclination and inactivity in some quarters, to find an enterprising publisher, who, by presenting a series of booklets to the public has made a small but very real contribution in focusing attention on the varied attractions of the South Island scene. The New Zealand Holiday Guides, of which the books discussed here comprise the first five numbers, make a most attractive series.

These inexpensive booklets are uniform in format, and range in length from thirty-eight to almost one hundred pages. Cover illustrations by E. Mervyn Taylor are pleasing and manage to capture the atmosphere of various South Island countrysides. Each volume contains a small portfolio of photographs which, although well chosen, lack uniformity in their reproduction and contrast. Those in *The Southern Alps* provide an exception.

As the name of the series would imply, these are guide books for tourists, and are written in a popular and interesting manner, describing briefly tramps for both young and old, climbs and launch trips, hunting areas and relics of past history. In addition, useful cautionary advice is given about foods and equipment, dangers to the motorist, and the ethics of mountaineering and shooting.

For the geographer the general introductory statements are the most interesting. However, without exception, sandwiched within the body of the text are snippets of useful information, glimpses of representative landscapes and indications of the past geography of certain areas. In particular the two books by N. S. Seaward provide information about Fiordland-Stewart Island not yet readily available from geographic sources. On the other hand it is difficult to understand a guide book on Central Otago giving scant mention to low livestock carrying capacity and omitting some explanation of the man-made desert which is, areally, so obvious.

Central Otago, Stewart Island and *Milford Country* follow similar patterns. Introductions or prefaces of a general nature are followed by more specific descriptions of walks, tramping routes or launch excursions. *Rifle Sport* and *The Southern Alps* are different. The former includes within its pages references to methods of hunting, to the selection of equipment, and to the skinning and care of trophies, together with a section on such big game as moose, wapiti, axis deer, chamois, tahr and wild pig. Of special interest are short histories of various animals since their liberation and two maps showing the distribution of game animals in the South Island.

In *The Southern Alps: From the Kaikouras to the Rangitata* John Pascoe tackles a problem in a masterly manner. His is a formidable task encompassing a logical and systematic treatment of 'fifty valleys, two hundred peaks and one hundred passes'. The description flows freely. 'Here [in the Arrowsmith Range] is some of the highest and wildest scenery in our part of the Southern Alps. Here are new routes, new gorges, and new problems to stir the blood of rising ambitions. Here also are river flats and views to give joy to an elderly climber. Here is the seed and here is the harvest.'

In addition to photographs, Mr. Pascoe's work is equipped with ten well-drawn maps—a contrast to the poor and indequate map coverage in the other booklets. In *Central Otago* reference is made to at least eighteen mountain ranges, none of which is indicated on a map. The scale of those maps which do appear is too small. It would seem that the essential function of a guide book is to provide well-drawn, large-scale maps locating *all* significant features to which attention is drawn in the text.

Yet there is little doubt that the series, notwithstanding poor arrangement in some numbers, will, in the words of Mr. Seaward, 'fire the imagination of readers and make some wish to see for themselves what breathtaking beauty lies in the midst of this mountain country'.—B. H. FARRELL

A HISTORY OF AMERICAN GEOGRAPHY

GEOGRAPHY IN THE MAKING: The American Geographical Society, 1851-1951. By John Kirtland Wright. New York: The American Geographical Society, 1952, pp. 437.

The American Geographical Society, so well known beyond the Americas by its special publications and its journal, the *Geographical Review*, celebrated its centennial in 1951 and the occasion has been marked by the publication of a scholarly history of its development and achievements. The author, Dr. Wright, who has been in turn Librarian and Director of the society, has proved himself well-fitted to produce a book worthy of a great theme.

The layman's idea of a good history of any institution or movement is that it should present a chronicle of events with sufficient background to show their significance, and at the same time be lively enough to re-create the atmosphere of the times. The book measures up easily to these requirements throughout its 437 pages, commencing with 'a rapid tour of New York as it was in the early fifties' and introducing some of the men whose interests, enthusiasm and vision were responsible for the founding of a society which held its first meetings in rooms made available by the University of the City of New York.

Those relatively tranquil times were favourable for the birth and growth of such societies, 'and men were free to roam the world in mind and body'. There were seven years of growth, in which the society established a journal and library and moved into new premises, followed by nine years of decline—a consequence, in part, of the Civil War. The whole period of sixteen years is described as 'the years of Henry Grinnell', a tribute to the greatest of the several founders. Most of them were business men, clergymen and journalists; and the author makes the interesting comment that he was unable to find in the available record any representatives of teaching, medicine, or arms. This is in curious contrast to the early composition of a sister society across the Atlantic. The members were actively interested in affairs at home and abroad, took part in some explorations and devoted some resources to the production of maps. The author remarks that they were untroubled by the question: 'What is geography?' so often debated in later times.

In the period of rebuilding, 1868-1884, the name of Judge Daly stands out, and the nature of his influence is well traced by extracts from his addresses and correspondence. Throughout this history of the society's affairs are sections which will appeal to all who have had experience of office in any society as councillors, editors or librarians. The work is notable also for the way in which trends in geography are traced. In the early years there was understandably a preoccupation with exploration. The definition of new trends seems to have owed much to W. M. Davis, of

Harvard, who as early as 1894 drew attention to the starved condition of geography in the lower schools, and the need for geographical survey of home states. From that time on the influence of professional and educational geography was more marked in the activities of the society. Great names of the succeeding eras, such as Archer Milton Huntington and Isaiah Bowman, will be better known to modern readers who will find both tribute and assessment skilfully presented. This is the point at which Dr. Wright brings all his wisdom into play and the chapter 'Geography in its Diversity' (1915-1951) and the three which follow are indispensable reading for all who feel the need to summarise and take stock.

It remains to add that the appendices contain every reference that one could reasonably expect, and that the typography, illustration, and format of the book are in keeping with the importance of its theme.—R. A. FALLA

A CONTRIBUTION TO METHODOLOGY

GEOGRAPHY IN THE SECONDARY SCHOOL. By E. W. H. Briault and D. H. Shave. Sheffield: The Geographical Association, 1952, pp. 36.

Most of the contents of this memorandum, prepared with special reference to the secondary modern school in Britain, demonstrate methods closely allied to the best in vogue in New Zealand; but the publication is of particular value in this country where many of our secondary school teachers are not so skilled in the teaching of geography as they are in the 'older' subjects of the curriculum. The writers deal skilfully with the contribution of geography to education. 'It teaches', they say, 'a recognisable body of facts, using a characteristic technique of description in which the verbal and the visual are blended; it makes a special study of relationships and encourages consideration of its concepts on a world scale.'

'Good Geography Teaching' is a specially valuable section. Here the interest of the pupils is rightly considered fundamental. Methods of presenting the subject are set down in detail, and will be of great assistance to teachers who are looking for sound aims and methods in their work. Such people will not be discouraged by the authors' assertion that successful geography teaching means hard work. The section which deals with the content and organisation of the geography course presents a full scheme of work in the subject. The 'topic' scheme outlined is very interesting. This ingeniously links regional and systematic geography in a thoroughly practical manner.

A strong point is made of the fact that geography teaching should not be confined to the classroom. 'That there is no geography without exploration' is stressed by showing how local studies, day excursions, and school camps or journeys can be made a vital part of the curriculum. This is an aspect of geography teaching concerning which most New Zealand teachers are somewhat timid, and for that reason, this section will be of particular value to them.

The memorandum also contains a good section, 'Equipment'. The slavish adherence to a single textbook is stoutly denounced, and methods of pupil research are applauded. It is encouraging to read of the importance attached by the authors to the geography room, although the word 'almost' should be deleted from their statement that 'geography has almost as great a claim to a special room as science or art'.

One completes the reading of the memorandum with a feeling that its authors have dealt with their subject completely, lucidly and logically. The reviewer heartily recommends its study both to young teachers with a specialised knowledge of the subject, and to more experienced teachers who have had to 'adopt' geography as a comparatively new subject in the curriculum of secondary schools in this country.

—H. G. DORRINGTON

A TEXTBOOK OF CULTURAL GEOGRAPHY

GRAPHIC GEOGRAPHY: VOLUME I, REGIONS AND MEN. By E. Ford and B. Rowe. Sydney: Angus and Robertson, 1951, pp. 144.

This book contains a wealth of material on a limited field. It deals with secondary industries, cities, and regional studies, and has a final chapter on conservation. It should prove very useful to teachers in secondary schools and to first-year students of geography.

After a brief introduction on processing industries, comprehensive descriptions are given of the Leeds-Bradford woollen industry, of activities associated with lead-zinc-silver mining at Broken Hill, of steel manufacture, with special reference to the United States, and of industrial development in South Wales and in the Tweed Valley.

The next section commences with a discussion of the generalised activity pattern of a city. Sydney, New York and London are the examples chosen, similarities and contrasts being emphasised. The Hunter River Valley and the Liverpool-Manchester area are described in considerable detail. The inclusion of a detailed study of an important Asiatic manufacturing region would have been valuable.

The book contains no pictorial illustrations, but an outstanding feature is the wealth of good sketch maps, diagrams and generalised charts of industrial processes. The maps range from those of a rather complicated character to simple line drawings, but in every case there is clarity of purpose. Teachers and students have much to learn from the sound techniques employed by the authors in the production of these maps and diagrams.

Throughout prominence has been given to man's activities, with, as the authors say in their introduction, 'just such emphasis on the physical side as should lead to a fuller appreciation of them'.—A. H. PAYNE

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The New Zealand Geographical Society was founded officially in Wellington towards the end of 1944. Its real foundation, however, took place in Christchurch in 1939 when a group of enthusiasts formed what is now the Canterbury Branch of the Society. Their lead was followed in February 1944 in Wellington, and further branches came into being in Auckland and Dunedin early in 1945.

The aims of the Society as stated in the constitution are 'to promote and stimulate the study of geography'. These are the aims of more than one Society in the world and the New Zealand Geographical Society is particularly concerned with geography in New Zealand. It is therefore the Society's policy to stimulate geographic studies of New Zealand and matters closely related to the Dominion.

The Society undertakes the publication of a journal, the *New Zealand Geographer*, and of a *Record* of its proceedings, both of which at present appear twice a year. Branches of the Society organise lectures, study groups, and excursions, and encourage their members to prepare matter for publication in the *New Zealand Geographer*. Contributions from overseas writers and those who are not members of the Society are also encouraged.

Membership of the Society is open to all persons interested in the aims of the Society. Full details of membership will be sent on request by the Secretary, New Zealand Geographical Society, Department of Geography, Canterbury University College, Christchurch, C.1.

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